Rock Products

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Unloading and Storing Ohio River Sand and Gravel

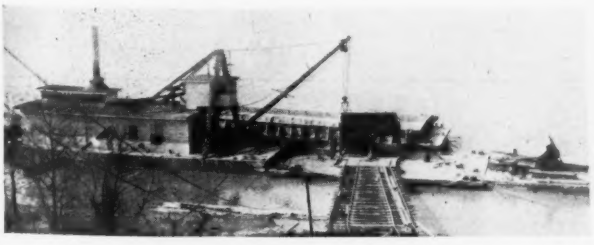
E. T. Slider Co., Louisville, Ky., Uses Unique Methods in Handling Material Between Dock and Storage. No Conveyors or Elevators in Entire Plant. Storage Has Concrete Floor and Holds 25,000 Tons

THE unloading and storage plant of the E. T. Slider Co., Campbell street, Louisville, Ky., is perhaps the only one of its kind in the sand and gravel industry. Although the principles of its operation are the same as may be found at other plants, some of the features are of singular design and may rightfully be classed as unique.

The company operates a clamshell-bucket digger which, in addition to supplying the Campbell street plant, supplies the New Albany (Ind.) plant, individually owned by E. T. Slider. This boat was described in the article, "Floating Screening, Washing and Crushing Plant," in ROCK PRODUCTS of April 24, 1920, pages 19 and 20. The digger operates about five miles upstream from the plant and the material is hauled in barges from it to the plant by the company's steamer. All materials, of course, are ready for delivery upon their arrival at the unloading dock, having been washed and screened aboard the floating digger and plant.

The derrick, or unloading boat, is 80 ft. long, 32 ft. wide and 5 ft. deep, and is of wooden construction. Its deck has a 4-in. covering of concrete and all of the machinery is set up on concrete foundations. It is said to be the only boat in use in the sand and gravel industry having these features. The boom is 80 ft. long and is swung by gravity, the closing chain being used for swinging the load toward the hopper. After

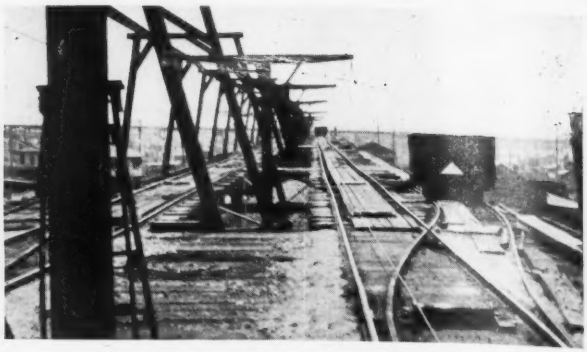
General view of the storage yard showing the company's fleet of trucks. Two sets of scales lessen the congestion of outgoing trucks. Note that the entire yard has a concrete floor



Unloading boat and hopper float. Both have 4-in. concrete decks

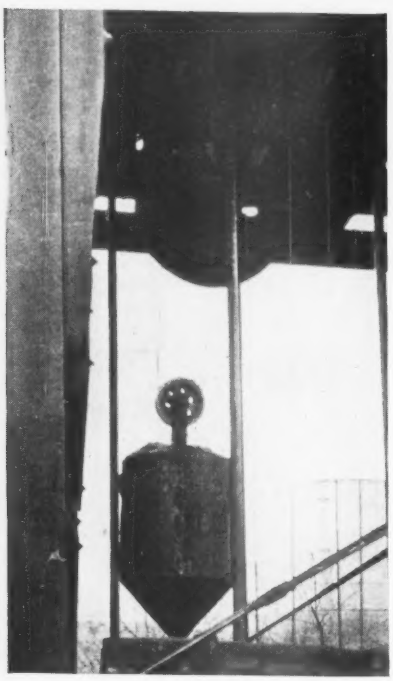
This shows how the tracks from the float connect with the incline irrespective of the river stage

A loaded car about to pick up the return-cable hook; this hook is inserted in a slot



The trestle is 600 ft. long and the cars can be dumped wherever desired

dumping, the drum is released and the boom's own weight swings it back over the barge being unloaded. The boom is equipped with a 1⅝-yd. Hayward clamshell bucket hoisted by a 1-in. chain. The swinging and closing are performed by a ⅞-in. chain. Hoisting is accomplished with a double-drum hoisting engine of 12x16-in cylinder, powered by an 80-hp. horizontal tubular boiler.



From each drum is suspended one of these steel-slug-filled cylinders. When a car is dumped the cylinder acts as a counter-weight, pulling the empty car back to the top of the incline

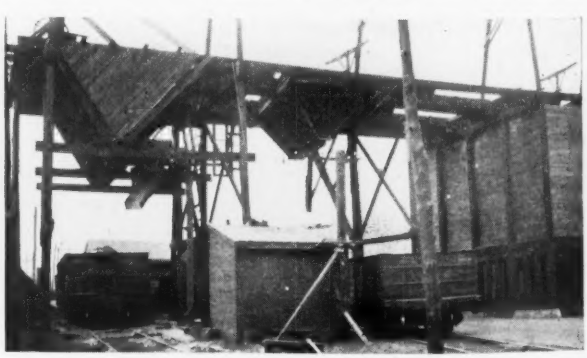
The receiving hopper is mounted on a float which also has a concrete deck. It is 32 ft. wide by 60 ft. long and at a normal river stage is approximately 25 ft. from shore. Two loading tracks—one for each bin of the hopper—are laid on four structural-steel spans extending from the foot of the incline to the hopper. These spans are 70 ft. long and are used in that length in order to obtain a reasonable incline and at the same time keep the dock far enough from the shore that barges will not ground.

At the top of the incline is installed the unique feature of the operation—a method of returning empty cars. The incline is about 300 ft. long at an approximate grade of 35 per cent. At the top, the two tracks continue at level grade over a trestle of wooden construction for a distance of 600 ft. and the cars are dumped from any point on it into storage. About two-thirds of the distance up the incline, and mounted on it, are two big 48-in. drums—one under each track.

The drums operate independently of each other and each is provided with enough cable to extend to the end of the trestle—a little more than 600 ft. From each drum is suspended a cone-shaped bottom steel cylinder, 3 ft. in diameter, 5 ft. long, filled with steel slugs, and fitted with a double

This 1½-yd. skip bucket is THE essential in the loading of cars from storage

Trucks are loaded by conveyor loaders like this one and carry the sand or gravel to the skip hoist

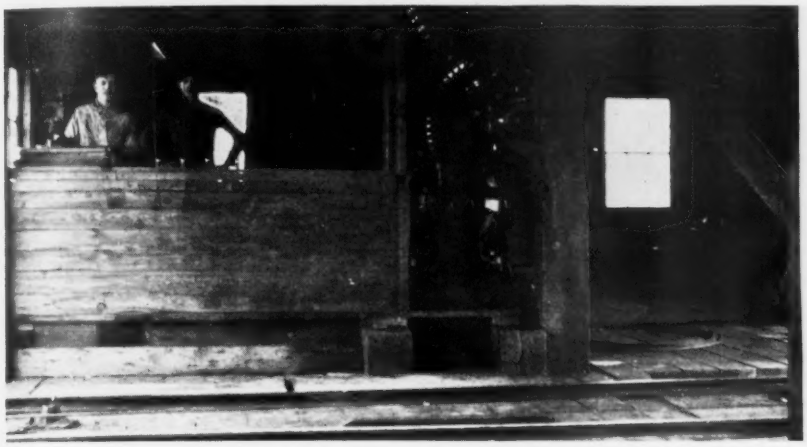


These two V-shaped bins make possible the direct loading of eight railway cars without switching

sheave. The cylinders, of course, act as counter-weights for the returning of cars from the end of the trestle.

The loose end of the cable is provided with a flat homemade hook. This end passes through a sheave above the drum on top of the trestle and extends to the top of the incline. There the hook is fitted into a specially designed slot in such a way that it is raised approximately 8 in. above the trestle floor.

Each of the cars is provided with an iron eye at the front end which is fitted in a corresponding position to the hook so that when the car comes up it picks up the hook. The car continues to its dumping point, carrying the counter-weight cable with it. As the car is pulled forward on the trestle, the counter-weight is being raised by the same power that moves the loaded car.



The hoist is mounted at the top of the incline so that the operator has a commanding view in both directions

The cars, which are of 100-cu. ft. capacity, are side dumped automatically at any point on the trestle by trip blocks set on the track at the desired dumping point. If the operator desires to change the dumping point he has his helper move the trip block. Then all he has to do is pull out a chock and release the load-line drum—the weight pulls the car back to the new dumping point. Should the new dumping point be beyond the present one, his helper moves the trip-block after the car has gone the required distance.

After the car is dumped and the load line slackened, the weight of the weighted cylinder returns it to the top of the incline without the application of power. Returning to the top of the incline after dumping, the car's speed is reduced by the application of power on the load line, and as the car passes over the slot it deposits the hook which is held there while the car is being let down for another load. Thus the system is entirely automatic and is a great factor in speedily unloading and storing materials.

The height of the trestle is 33 ft., which provides for the storage of approximately 25,000 cu. yd. of material. In addition to this trestle there is a cross trestle. Cars on the cross trestle are handled by a separate hoist and are loaded by dumping direct from the main-trestle cars. This trestle is used only for the storage of sand.

Truck-loading bins are mounted at the end of the main trestle. There are six in all, two of which are of 350-yd. capacity, and the other four 250-yd. In addition to these, two small V-shaped bins, or hoppers, are provided for the direct loading of railway cars.

The loading of trucks from storage is accomplished by three Link-Belt industrial conveyor loaders, equipped with 7½-hp. motors. Railway cars are loaded by hauling in trucks from storage to a ground hopper. Within this hopper is provided a 1½-yd. Galion skip bucket which works vertically on a track, raising 15 ft. and dumping into the car. This equipment is powered by a Godfrey Conveyor Co. hoist and was specially designed for this particular operation.

The E. T. Slider company's operation is unusually flexible and the handling of materials into, as well as out of, its unloading and storage plant is done in the fastest manner possible. The company is made up of E. T. Slider, C. C. Slider, and J. E. Lloyd, all of Louisville.

Construction Award Contracts Show Increase

ACCORDING to figures furnished by the American contractors, 2517 contracts, with a total valuation of $95,278,400, were awarded during the week ending May 25 in the 27 Northeastern states. This is a decided increase over previous weeks. There can be no doubting that there will be an active demand for sand, gravel and crushed stone throughout the year and that this demand will continue for a number of years hence due to the long-deferred construction needs of the country.

Bureau of Mines Finds Wide Application for Pulverized Limestone

IN the progress of a study of methods of utilization of waste rock at lime-plant quarries, being conducted by the Bureau of Mines, it has been found that limestone pulverized to a much finer grained form than for agricultural use is finding wide application in various products. Small quantities may be added to stock food as a bone builder. A dust approximately 80 per cent of which will pass a 200-mesh screen is the most widely used filler in road asphalt surface mixtures, though slate flour and portland cement and hydrated lime are used to some extent.

Ground limestone is used to a limited extent as a fertilizer filler. It has the advantage over inert fillers in that it has valuable properties as a soil conditioner. Very finely pulverized limestone may be used successfully as a whiting substitute in certain classes of rubber, paint and other products. It is essential for such uses that it be very finely ground and uniformly sized so as to exclude all comparatively large-sized grains.

In general, a limestone flour that will successfully meet the requirements of fillers of a type like whiting or china clay should approximate 300-mesh size. Few lime-plant quarries have the equipment for grinding or sizing to this degree of fineness, and have therefore been able to utilize this promising field of application.

Waste Limestone for Road Building

SMALL-SIZED limestone, or fragments unsuited for lime manufacture, constituting a by-product at lime-plant quarries, are used extensively for road building, states Oliver Bowles, mineral technologist of the Department of the Interior, in Serial 2463, just published by the Bureau of Mines. In districts where road stone is widely distributed and plentiful, it commands so low a price that lime plants can sell it only in limited quantities in local territory. However, some road-building projects are undertaken in regions where rock is not easily obtainable, and instances have been noted where the necessary supplies of small-sized stone have been purchased at mile plants many miles distant, even involving a combined rail and water haul.

It is possible, therefore, through enterprising salesmanship to develop a wider market for waste as road stone than that which now exists. Serial 2463, "Utilization of Waste Rock at Lime Plants," may be obtained from the Department of the Interior, Bureau of Mines, Washington, D. C.

The Gypsum Industry From a Quality Man's Viewpoint

No. 1—The Need of Research—Gypsum Plaster Manufacture by the Kettle Process

THE development of new uses for raw and calcined gypsum has been so rapid during the last few years that it seems so much attention has been given to operating facilities for supplying the increased demand and production and not enough thought has been given to the betterment of the quality of gypsum products. It appears that we need more laboratory research work to help solve many of the problems that daily confront the manufacturer and the consumer.

It is perhaps unnecessary to state that the quality of products can be improved at many plants by the sacrifice of less production, temporarily, in the way of slowing grinders, driers, calciners, and mixers, to a capacity that would insure the machines performing their intended duty to promote a reasonable output and a high, uniform standard of quality.

The experience of large manufacturers has proven, however, that the most progressive "quality insurance" is maintained by well-equipped laboratories and conscientious routine and research work. It has been found cheaper and more progressive to learn the causes which promote apparently peculiar properties of gypsum, by research work in the laboratory rather than by experience in the plant or in the field.

The Need for Research

Research work leads to the adoption of valuable findings by industry by bringing to our attention in an interesting and impressive way certain facts that we may or may not have known, but if we did know we did not fully realize or at least so seriously consider.

Calcined gypsum, which is the cementitious basis of all gypsum wall plasters, gypsum wall boards and plaster boards, gypsum blocks and tile, is in reality one of the simplest products to manufacture. No chemicals or other ingredients are necessarily added during the process of manufacture, the raw gypsum rock being usually first crushed and then calcined by heating until approximately 75 per cent of the water of crystallization is driven off. Theoretically, pure gypsum contains 20.9 per cent water in chemical combination, but gypsum deposits invariably produce rock containing from 19.0 to 22.5 per cent water.

Perhaps it is because of the fact that it does not require the supervision of an expert or an analytical chemist to manufacture calcined plaster of fairly marketable quality that has led to the continuation of many obsolete methods of manufacturing at some plants, and complaints in the market of the quality, the causes for which manufacturers have been unable to learn.

A careful analysis of conditions has shown that every step in the process of manufacture of calcined plaster changes in some way the quality of the finished product. Putting this in other words, any ununiformity which occurs at a certain point during manufacture will be followed by an ununiformity in the quality of the finished product. Whether the law of averages will conceal this defect depends upon the duration or extent of the ununiform condition which occurred.

This shows that unless each operation is checked from a quality as well as a production standpoint, the origin of defects in the quality of products cannot be traced.

Editor's Note

THIS is the first of a series of articles on gypsum plaster manufacture by a man who has spent several years doing research work in the gypsum industry. There is a rather short-sighted policy on the part of some gypsum manufacturers of viewing this industry as a secret-process development. In no other industry has such a policy succeeded; but progress in all modern industries is based almost wholly upon a free interchange of scientific knowledge and attainment. It is hoped that this article, and material of a similar nature now available from other sources, will serve to open up a subject which has long needed a more frank treatment.—N. C. R.

The Kettle Process

Two processes are employed by manufacturers in the Eastern states for calcining rock or massive gypsum. These are the Kettle process, by which the rock is calcined after grinding, and the Cummer process, by which the rock is calcined before grinding. The Cummer process is a more modern method of calcination, being a continuous process similar to that used in the manufacture of portland cement. The Kettle process is more universally used throughout the states at present and is apparently the necessary process for calcining gypsite. The usual operations which are employed in a plant which manufactures calcined gypsum by the Kettle process are here briefly described:

The rock, which is hauled from the mine or quarry in man-size chunks upon tramcars, is weighed, then broken up generally by a large gyratory crusher. From this crusher the rock is fed to a jaw crusher and carried by a bucket elevator and belt conveyor to an enclosed storage bin or to a stockpile in the open.

The rock, which is now reduced to about a maximum 3-in. size, is fed by a belt conveyor to a rotating cylindrical drier about 30 ft. long. The rock passes through this drier in about 5 min. and is heated to about 150 deg. F. This drier is heated usually by a direct coal fire, which drives the free moisture from the rock, thus rendering it to a more suitable state for further crushing and fine grinding.

At some plants, and mainly at quarry deposits in arid sections of the country, the rock is not dried before grinding except by exposure to the air in storage sheds.

From the rotating drier the rock is fed to swing-hammer, rotary, or other crushers and reduced to about ¾-in. maximum size, then conveyed to bins by screw conveyors. From these bins it is automatically fed to mills which grind the material to its final fineness before being calcined. These are usually either burr mills or Raymond mills, the latter being a form of air-separation. Tube mills are also being tried out for grinding gypsum at some plants.

The product is now sufficiently fine so that from 70 to 90 per cent will pass a 100-mesh sieve, the resulting fineness depending upon requirements to meet its local commercial use.

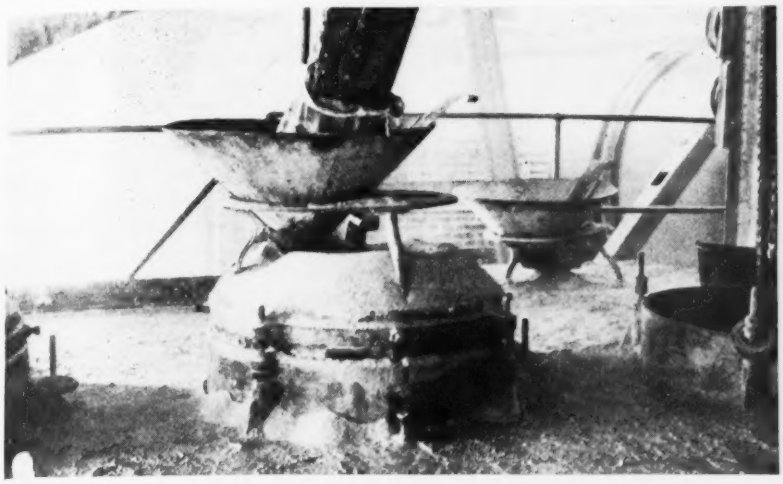
Land Plaster

This raw, finely ground product now attains the commercial name of "land plaster" and is carried by screw conveyors to the land-plaster bins, these bins

being usually located directly over the calcining kettles.

The large iron kettles at many mills have a capacity averaging 10 tons of ground gypsum. They are set in brickwork and heated by direct coal fire, and at a few mills by gas. Paddles propelled by a gear-driven vertical shaft keep the mass stirred between the flues and from the convex iron bottom of the kettle.

The top of each kettle is covered with sheet iron and is fitted with a small door for observing the contents and a thermometer to check uniform firing and calcining.



Burr mills in operation in modern gypsum plant—Photo from Rock Products files

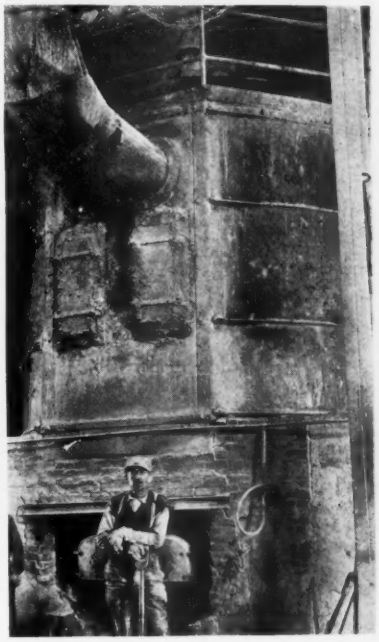
The kettles should be filled slowly with the raw, damp gypsum to prevent sticking or stopping the revolving paddles.

Physical Characteristics of Ground Gypsum

A physical characteristic of ground gypsum is that the mass, after being heated sufficiently, will apparently boil violently, then the surface will calm and settle, and after further heating and boiling the surface will again calm and settle a second time. Experience at many Eastern plants shows that this first settling occurs after the gypsum has been held in the kettle about 1 hr. and will invariably record a temperature of 325 to 340 deg. Fahr. The second settle will occur about 45 min. after the first settle, or when the gypsum registers a temperature of from 400 to 435 deg. Fahr. The time and temperature required for calcination depend mainly upon the dryness of the rock and its chemical purity.

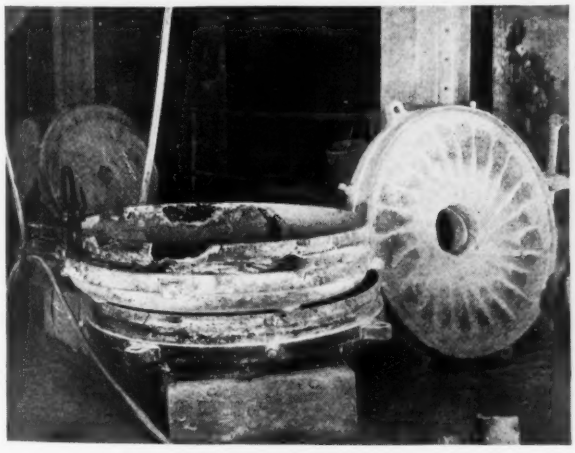
Most deposits of massive rock vary so little in analysis that they are calcined at temperatures which do not vary from a range of more than 10 deg. Fahr. It should be understood that uniform calcination is judged usually more by the appearance of the kettle by an experienced operator than by a desire to "dump" the kettle at a certain fixed temperature, and that the thermometers are used more to assist the operator in knowing when the calcination is approaching the "first-settle" or "second-settle" stage.

Perhaps it should be stated that the above observation of time and temperature were made when calcining gypsum which averaged very closely to this analysis:

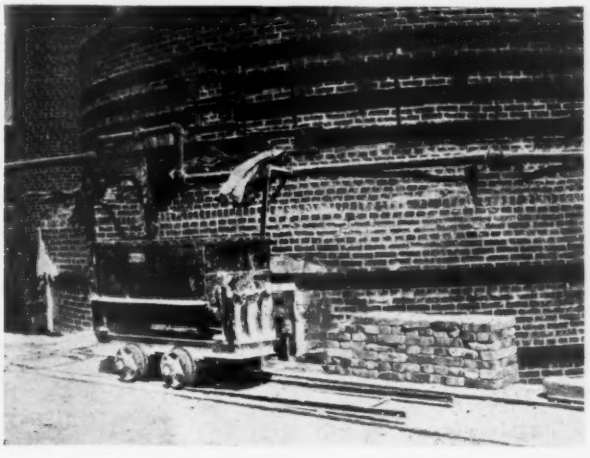


Gypsum calcining kettle—Photo from Rock Products files

	Pct.
Water and organic loss	19.68
Silica and insoluble residue	0.66
Iron oxide and alumina	0.28
Calcium sulphate	78.20
Calcium carbonate	0.84
Magnesium carbonate	0.66



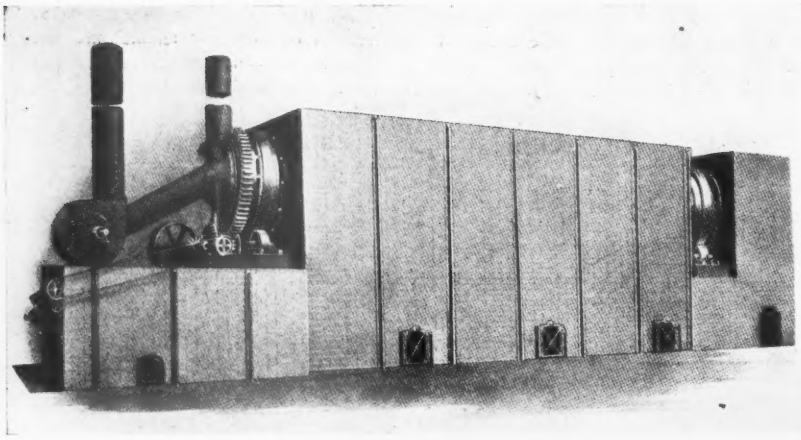
Grinding stones of burr mill—Photo from Rock Products files



Gypsite calcining kettle of large capacity—Photo from Rock Products files

Impurities in the rock tend to retard the time of calcination.

The gypsum now calcined is released from the kettle (usually after the first settle for reasons explained later) by means of a small gate near the bottom, and runs into a small bin commonly known at a hot pit. While the next kettle is being filled the calcined gypsum is conveyed and elevated to the top or third story of the mill and run through



Cummer rotary gypsum calciner

vibrating screens which separate small moisture lumps from the product. The material is now conveyed to large storage bins ready for shipment as calcined gypsum, or to be mixed with other ingredients for manufacture into various grades of wall plaster, or for manufacturing into plaster or wall boards, building blocks or tile at the mill.

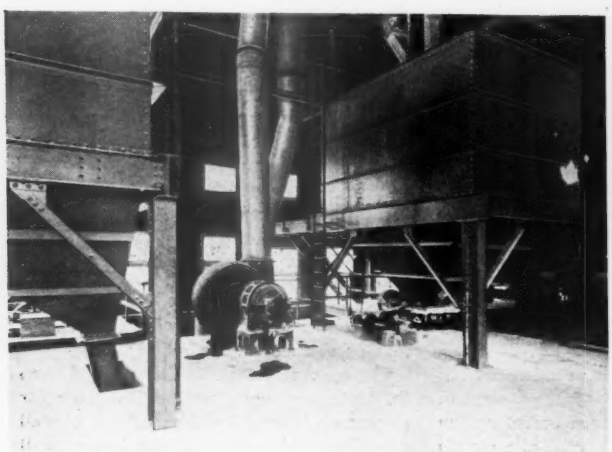
Trade Names of Calcined Gypsum

Calcined gypsum is known on the market under a great variety of trade names such as plaster of paris, stucco, calcined plaster, pottery plaster, gauging plaster, and molding plaster, and all the names denote an identical product, viz., calcined gypsum. To avoid confusion, the words "calcined gypsum" will be adopted with reference to the product so called in later descriptions. Also to make the result of nearly all later experiments appear more intelligent, perhaps it should be stated that the rock deposits from which the samples were manufactured bear a very close analysis to that previously given.

The gypsite deposits which have been worked mainly in the Western and Southern states are usually of a soft pulverulent nature, brownish in color and lying close to the surface of the ground. The gypsite is usually loosened from the ground, after the overburden is scraped off, by plows and horse scrapers and then taken to the mill by wheel scrapers or wagons. At the mill it is dumped into a bin from which it is conveyed and elevated directly to the kettles. Only one grate-like screen separates the pieces of wood or hard lumps from the stream before it enters the kettles.

No drying or grinding takes place as its raw, granulous nature promotes the manufacture of a product sufficiently plastic for many uses simply by calcination. As a rule gypsite deposits are poorer and less uniform in quality than deposits of rock or massive gypsum, and the gypsite, containing more impurities, requires much more time for calcination. Usually from 3 to 4 hr. are required to calcine gypsite to the first settle stage and the calcined product varies greatly in setting properties—the setting time at some deposits ranging from 30 min. to 3 hr. As a rule, calcined plaster manufactured from rock gypsum will set within a range of from 10 or 15 min., usually from 25 to 40 min. actual setting time. *(To be continued)*

Modern burr mill installation for grinding gypsum—Photo from Rock Products files



Exhauster with discharge and return air piping. The storage bin for crude gypsum received from the drier is on the left and ground gypsum on the right

Five-roller mill on the ground floor equipped with air separator. In the left background is the gypsum drier

Novel Way of Dumping Overburden in a Worked-Out Quarry

By Using a Suspension Trestle This Company Utilizes a Huge Dumping Area

THE Palmetto Quarries Co., Columbia, S. C., has in service at its granite operation a method of disposing of its overburden that is unique in the rock products industries, and which might be used to advantage by other operators whose overburden disposal problems are similar.

Two cars at a time can be dumped here by one man

The greatest difficulty that this company has encountered in this phase of its operation is in the character of the overburden itself. This material is a red, mucky clay and consequently hard to handle.

For many years the company, through its inability to dump it without using double the usual amount of labor, was under heavy expense handling this overburden. In using the common method of dumping —that of having a track extending the length of a dump and dumping on one side, moving the track outward as the dump builds up—whenever a car was dumped, the contents would pile up, refusing to slip or slide, thereby necessitating man-power to push it down. As the quarry was extended, however, the overburden became so excessive that some way must be provided to reduce this abnormal cost.

To Superintendent T. M. Hanna is given credit for the layout installed which is now serving so acceptably. As can be seen in the illustrations, the company has a great amount of space for dumping—a worked-out quarry several hundred feet in length and breadth and averaging 80 ft. in depth, filled with water. Owing to the great depth of the abandoned quarry, a trestle of standard construction was not considered. It was decided, after considerable study, that a track, suspended on one end from a cable and having the old dump as its support on the other end, would answer the purpose and serve quite as satisfactorily as a trestle.

Accordingly, Mr. Hanna drew up plans and, using original ideas, constructed the dumping arrangement illustrated herewith. The equipment comprises two A-frames—one on either side of the quarry—made up of 10x10-in. long-leaf-pine timbers, 30 ft. high, 20 ft. apart at the base and 12 ft. apart at the top. The distance between the two A-frames is approximately 300 ft. A 1¼-in. cable, secured to a deadman at one end, spans both A-frames; passes through a sheave at the opposite end and thence makes a second span of the two A-frames, and is fastened to a turnbuckle which is secured to the same deadman as the other end of the cable, thus forming a two-track cableway across the quarry.

Two sheaves on each cable form an overhead carrier from which is suspended, by 4-ft. turnbuckles a 55-ft. section of track. This section of track differs only from track of ordinary construction in that it is mounted on two 16-in. by 55-ft. timbers, so that when it is necessary to extend the track it may be moved by using crowbars to "pinch" it forward. As the section is more than 50 ft. in length, one move is sufficient to permit dumping

One move forward of this section of track gives several weeks of dumping accommodations

This gives an idea of how much dumping space is available. The black spot in the lake is the top of an 80-ft. tree

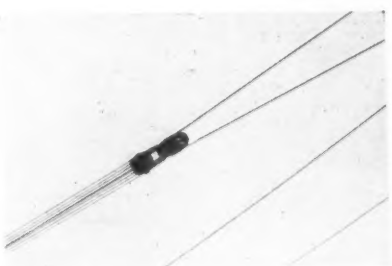
for several weeks, as each move gives 30 linear feet of dumping space approximately 105 ft. deep, the track being suspended 25 ft. above water level. In this way, after moving forward, the intervening space between the stationary track and the movable track can be provided with standard 30- or 33-ft. lengths of rail.

The most interesting feature of this entire layout is the method of taking up the slack of the track cables and keeping them at proper tension. At the end of the cableway opposite the dumping end, the 1¼-in. track line passes through an 18-in. one-pulley sheave and returns, forming the second track. The sheave through which the track line passes is connected to a 12-in. four-pulley sheave, giving an eight-part connection to a similar sheave, which in turn is connected to a concrete deadman by a six-part line. With this arrangement the slack can be taken up by one team of mules.

This series of sheaves comprises the take-up system. The track lines pass over hardwood blocks on the A-frame

All rope used in this operation is plow steel, blue center, manufactured by John A. Roebling's Sons Co. Each A-frame is provided with four ¾-in. guys as a safety precaution.

Stripping is handled with a No. 18 Os-good steam shovel, with a ⅞-yd. bucket, loading into 2-yd. Easton two-way-dump steel cars. At present the company is using a 6x7-in. single-drum steam hoist to move the cars from the shovel to the dumping point, but it is planned to replace this method with a four-ton gasoline locomotive.



With this sheave arrangement it is possible to take up slack with one team of mules

The Southern Talc Industry

THE talc industry in the South is confined to North Carolina, Georgia, Tennessee, Virginia and Alabama, states R. B. Ladoo, mineral technologist of the Department of the Interior in Bulletin 213, recently issued by the Bureau of Mines. Tennessee is not a producer of crude talc, but there are several talc-grinding or manufacturing plants in Chattanooga. Most of the mines and mills are small, and the output of ground talc is not a large factor in national production. Much of the talc, however, is high grade, and the deposits are important potentially as a possible source of toilet-grade talc. Most of the material now mined is of the massive or compact variety and is sawed into pencils, crayons, or tailor's chalk. A large proportion of all the talc crayons used in the United States has been produced in the South.

The talc mining and milling operations of the South are on such a small scale that economy of operation has not been possible. Except the pyrophyllite deposits in North Carolina, the veins are narrow, usually less than 15 ft.; 6 to 8-ft. veins are common. Many of the deposits are far from the railroad, which is accessible only by poor mountain roads. One mine now being worked for pencil stock is 18 miles from the nearest railroad siding. Lack of capital to build tram roads, cableways, and mills has prevented economical development.

At the mines farthest from the railroads no attempt has been made to save anything but pencil stock, and the pencils are sawed at the mines. All material not suitable for sawing and all the saw waste are thrown away, with the result that probably not over 20 per cent of the talc removed at such mines is marketed. In spite of this waste, a fair profit has been made on crayons and pencils, but talc mining in the South has not been profitable. It has been estimated that the market demand for all grades of talc crayons is from 200,000 to 225,000 gross a year, which would mean, at most, a yearly production of less than 1000 tons of talc in the form of pencils. The crayon business alone cannot yield a profit that will justify large operations. The present pencil-sawing capacity of the Southern mills will more than supply the entire domestic market.

The quality and extent of some of the deposits are such as to justify the erection of modern, well-equipped grinding plants of moderate size, and mills well situated with respect to transportation facilities; and the best deposits would justify expenditures large enough to insure economical mining and transportation.

New Officers of the American Road Builders' Association

AT the recent meeting of the American Road Builders' Association, held in New York City, the following officers were elected for the ensuing year:

President, Frank Page, chairman, State Highway Commission, Raleigh, N. C.; vice-president, northeastern district, E. L. Powers, editor *Good Roads*, New York City; vice-president, southern district; W. S. Keller, state highway engineer, Montgomery, Ala.; vice-president, central district, S. F. Beatty, vice-president, Austin-Western Road Machinery Co., Chicago, Ill.; vice-president, western district, Samuel Hill, honorary life president, Washington State Good Roads Association, Seattle, Wash.; treasurer, James H. MacDonald, consulting road and paving expert, New Haven, Conn.

Chicago has been selected as the next place of meeting and the date is January 13 to 19.

Cost Finding and Its Problems in the Sand, Gravel and Quarry Industries

No. I—What Costs Are. The Difference Between Costs and Accounting and the Nature of Cost Work. The Functions of Costs and the Problems of Cost Keeping. Systems Necessary in Bad Times and When Business Expands

By Alfred Baruch
Consulting Industrial Engineer, New York City

THERE is probably no other phase of business management today whose importance has been emphasized as much in recent years as that of cost keeping. Governmental agencies, chambers of commerce and trade associations have taken up the subject, and they are unanimous in their recommendations to various industries that cost keeping be included permanently in the management.

Still, writers on the subject of costs plan their books for popular consumption and set forth in them all their experience gathered from various industries. It is easy to see that the methods which would do for a rubber-working shop or a steel foundry would not be at all satisfactory for the rock products industry. It becomes necessary to develop a plan that is specially suitable to the sand and gravel operator or the quarryman. It is the writer's opinion that cost engineers could render much greater service to industry as a whole by offering to each group the particular and peculiar systems that are suitable for it.

Definition of Costs

In arriving at a definition of cost keeping it is well to make clear the distinction between it and general accounting, with which it is often confused. General accounting determines the profit and loss on the entire business. It also furnishes the balance sheet which shows the assets and liabilities of the business. It secures its information from the items posted by the bookkeeper who makes a record of the various business transactions. These when properly grouped and totaled furnish the accountant with his information. For this reason, all general accounting is exactly the same and all bookkeeping is fundamentally the same.

The general accounts should show the total of all labor and of all materials which have been purchased and also of all records of sales without regard to the details as to how these receipts or payments were brought about. These totals should be accurate, because they represent the requisitions, payrolls, sales orders, and other documents of a similar nature. These general or controlling accounts show whether the business is making money, *but they are unable to show where the trouble lies in case the business is failing.* They also indicate whether the total prices asked are enough to cover the total cost of production and insure a profit, *but they do not show the profit on any particular line or class of commodity. They do not show where the money is going. They do not show how much to charge for each class of work in order to make that particular class pay for itself.*

OUTLINE OF ARTICLES

THESE articles will describe a system designed especially for the rock products industries, and will be elaborated by descriptions of the use of each part of the system, with drawings showing the forms and records that must be maintained.

No. 1. Introduction. (The meaning of costs, the uses of a cost system, the advantages of uniform cost methods in a competitive group, and definitions of cost terms.)

No. 2. Classification of Materials and Expenditures. (A system of symbol identification of materials and expenses that make the distribution of costs automatic.)

No. 3. Estimates and Orders. (The use of an estimate sheet and the control of production through the proper routing and follow-up of orders.)

No. 4. Material Charges.

No. 5. Labor Records.

No. 6. Collection and Distribution of Burden.

No. 7. Proper Application of Burden Charges.

No. 8. Cost Reconciliation and Monthly Reports.

No. 9. A Hypothetical Case of Cost Operation in the Rock Products Industry.

Bookkeeping is recording the day's transactions that make up the totals aforementioned. In other words, the accountant summarizes the bookkeeper's daily work and deducts from it the total loss or the total profit on the business over a given period of time—usually a year. The total accounts are referred to as controlling accounts because they offer a check on the detailed entries which the bookkeeper makes. But neither the bookkeeper's nor the accountant's work brings out any detailed information as to the expense per job or the actual cost of production.

Difference Between Costs and Accounting

It is clear, then, that the main distinction between cost keeping and general accounting is this: General accounting reflects the business as a whole; cost keeping shows the details of production. It determines the profit and loss of each unit. It also shows how much to charge for each unit in order to make a profit on it. It distinguishes between overhead expenses and expenses that may be charged directly to a job. It analyzes the cost of every job and the cost of every product made.

Cost keeping makes a comparison between present and past performances. It sets definite limits on overhead expenses and warns the manager when the danger line is being approached. It indicates the general policy that a business must follow. It points out whether it would pay to extend the business by increasing the value of the work done or to contract the business by taking fewer orders. It points out currently when costs and expenses are running too high. When retrenchment is necessary, it shows just where and how much to cut. In this way, it is an active aid to the management and not merely a history of past performance to gaze at a year after the work is done.

The Nature of Cost Work

From the foregoing it can readily be seen that while bookkeeping and accounting are

functions of the office man and the regular clerical force, cost keeping is primarily a production function. It must be conducted by some one who is thoroughly familiar with the practical conditions of the plant, since it deals more with the details of production—that is, the practical or engineering work the plant does—than with the clerical work. As a matter of fact, cost-keeping records can be devised that require little *clerical* effort. All they require is a thorough and complete knowledge of the type of work done at the plant.

Of course, it is necessary to get the results of the cost keeping into the general books. This can be done very simply through the medium of several controlling accounts—that is, each of a general group making up shop costs represented by an account in the general ledger. For example, all labor payrolls are summarized in one account in the general ledger; all material expenditures would have another account; overhead expenses would have still another, and so on.

Functions of Costs

The function of cost keeping is to tell how much to charge in order to make a profit. This is done by considering the various elements of costs; namely, labor, material, and overhead. The cost records are based on these three elements. They call attention at once when any or all of them are being drawn on in excess of their budget limits. Cost keeping determines the percentage of overhead. It fixes an administrative and selling expense charge. It points out the lines that are profitable and those that are not. It determines with scientific accuracy how low a man may fix his price and still make a profit. It tells just where the money goes and where the leaks are. In other words, *it is the measure of the business.* No operator is safe without some practical cost-keeping system in operation.

Problems of Cost Keeping

Undoubtedly one of the reasons why cost keeping has not made greater progress among the industrial groups of the United States is the fact that cost keeping itself is beset by problems that do not appear in accounting, bookkeeping, or even in general engineering. There are many points that are debated even among cost engineers. This is largely due to the fact that each industrial group contributes its share of complications and problems. In order to install a cost system successfully, one has to pay special attention to *the conditions in his plant* and ignore experiences obtained in other fields.

One of the problems that has been of special interest to industry is that which has to do with the proper application of overhead. One group wishes to apply overhead on the basis of the cost of labor and material. This practice is known among cost engineers as the blanket rate method. Still another group wishes to apply overhead on the basis of direct labor costs, and a third on the basis of direct labor hours. All of these groups have their arguments and their experiences to justify their position.

Another problem presented to cost engineers is that of finding the proper basis on which to figure the cost. In the case of a continuous process industry, such as a lumber mill, the cost is naturally based on the linear foot of lumber produced. In the case of an automobile factory, the cost is based upon the department and the machines used in the department.

Alfred Baruch

Mr. Baruch is a graduate of Washington University, St. Louis, where he also studied industrial engineering. After some experience in foundries and machine shops he was called to Washington when the war broke out and became associated with other industrial engineers in converting the United States into a war machine. This task was to turn the ordinary machine shops into shell and gun factories, Mr. Baruch's particular job being to combine the best methods of American and Canadian munition plants as standard practice for our newly developed factories. In six months this work was completed and he joined his ship for the remainder of the World War, serving as a gunnery officer with the Atlantic fleet.

On his return to civilian life, Mr. Baruch joined the staff of one of our largest consulting firms, and later was one of the engineer group which reorganized the production methods of the Goodyear Tire and Rubber Co. His experiences, in a series of articles on scientific management, were published in "Rubber Age" and are now in book form.

Later, he began operating independently, and his first big effort was the standardization of estimating and cost methods for the sheet metal and roofing contractors. This work, which took a year, was adopted by the New York contractors. It is also published in book form.

Mr. Baruch repeated the same work for the clay workers, who have many problems in common with the sand and gravel producers. His contention has always been that most business failures are due to faulty management.

He has also been very successful in solving power-plant problems, as well as installing efficiency methods in the woodwork, garment-making and other industries.

Interest on invested capital is another controversial point. The Federal government does not permit a company to charge interest as a part of the cost, but the question of whether interest on the invested capital should be included in the cost when fixing the price or not has been debated for a great many years by bankers, cost engineers, manufacturers, and business men in general. One group wishes to exclude it, saying that it is a legitimate part of the cost, just as much as light, power, etc. The question of interest will be taken up in its proper place, and it is hoped that the solution offered will be satisfactory.

Accusations of Red Tape

One objection made to cost systems is that they are theoretical, impractical, and handicapped by red tape. These charges arise from two conditions. The first is that out of every group of business men who are addressed on the subject of costs there will always be one or two men who will say: "That sounds all right in theory, but it won't work out in practice." It depends upon what the man using a cost system has in mind. Most men dislike being shown that they have been in the wrong and they dread having pointed out to them errors that they have made in the past. For this reason they are inclined to put the stigma of red tape on any system at all.

As a matter of fact, red tape is purely relative. In the beginning of the present industrial organization, when a man was sole owner, sole worker and sole bookkeeper, it was not necessary to keep many records. The volume of his business was so small that keeping records was not justified. But with the division of labor and the expansion of modern industrial organization it became necessary for one man to do the managing of the business and for another to do the actual labor.

Best results can be obtained always by knowing what has to be done and by delegating the work to some one else. If a business is large and the work is widely scattered, many forms and documents will have to be used. If a business is small a few documents will suffice, but some records are always necessary. Thus the conclusion is forced upon us that red tape is only a relative term. If we try to use the system that is needed in a big organization to run a small plant, we would surely be exposing ourselves to the charge of red tape. But if the system is made to meet with the needs of each particular business such a charge is never justified.

As long as business is good and a man is prospering he may not find it necessary to install a cost system. In the reconstruction period immediately following the World War, the shortage of houses was so acute and the demand for work increased to such

proportions that competition was practically eliminated. Construction work was done away with during the war, but it began feverishly immediately after. Consequently sand and gravel were much in demand. The operator could get almost any figure he asked for his material. Under conditions such as these, a man might easily be excused for neglecting to keep proper records if he felt quite sure that he was making big money anyway.

But artificial activity terminated in a remarkably short time. This short-lived prosperity contained within itself the germ for its destruction. Prices began to mount higher and higher. More and larger operations were being undertaken. As a result, prices soon reached a level beyond the public's willingness or ability to pay.

The Cycle of Business Stagnation

The demand for work dropped to almost nothing. The operator as well as the producer found himself *with* abnormally high payrolls and with practically no demand for work. Naturally, he stopped work and laid off most of his men. His inability to buy stopped production in other industries. The spread of unemployment reduced the buying power of the public very materially. In order to stimulate buying dealers began to cut prices. When this began to happen people would not buy because they were waiting for prices to reach the bottom. That complicated matters further. This vicious cycle kept going round and round. People would not buy because prices were dropping. Unemployment increased because people were not buying. Being unemployed, they could not buy or build if they wanted to.

The orgy of spending is over. The buying public are a chastened lot now. They have been taught a hard lesson—and there are few who have not learned it. People will buy and they will build. But they will ask the price first and buy afterward, instead of buying first and asking the price afterward.

When the demand is abnormally great and the buyer is indiscriminate, the most inefficient operator can make money. Prices are high. The man who buys is too busy making money himself to think or care about the quality of what he is buying. But when the demand is normal and a man has to work hard for his money, he becomes careful in his buying. What he buys must be good and the price must be low. The work goes to the lowest bidder and it is not accepted unless it is good.

Only a highly efficient operator can make money when prices are low. Efficiency means the ratio between what is put into a business and what is taken out—that is, in order to make money the rock products operator must get more out than he puts in. The only way he can do this is by eliminating waste from his business. He must reduce to a minimum the idle time on the part of labor. He must see that materials are not wasted or stolen. He must keep his indirect or overhead expenses within the limits of absolute necessity. He can do this only by using well-designed cost records. That is the only way he can insure himself against inefficiency.

Cost Systems Necessary in Bad Times

The cost system actually becomes a necessity when business is not good. When business conditions are such that the margin between profits and loss is very small, no man can afford to do without a cost system unless he wishes to take the risk of loss. In that case he may be insolvent for a year, or even two, before he finds himself entirely bankrupt. If he had a cost system such a condition could never arise.

When profits are small in proportion to the volume of business, the owner of the business cannot trust to the general financial statement. He must find out where he is losing money and make some effort to remedy the evil.

Not a long time ago a foundry was forced into bankruptcy because it had undertaken to produce 200,000 castings at $7 per casting. This estimate was made without any cost records—a mere guess. When it came to actually turning out the work, it was found that each casting cost $8 instead of $7, and this company, bound by an ironclad contract, had to take a loss of $200,000, which was enough to put it out of business.

Cost Systems Necessary When Business Expands

A cost system also becomes an absolute necessity when business expands and becomes complicated. Then it is impossible for one man to carry all the details in his head. He either has to resort to a record system or else limit the capacity of his business to that of one man. But if a man aims to expand his business gradually it is well to have the skeleton of a cost system installed from the very beginning. Then it does not become necessary for him to break down established traditions of long standing.

Such traditions not only make for inaccuracy later on, but they create the very embarrassing situation as a rule of having to let an old employe go because he cannot conform to the new methods. A cost system provides for accuracy that no memory method, no matter how efficient it is, can possibly compete with. The only intelligent way to fix prices is on the basis of past performance and there is no man living who can commit to memory all of the labor costs of the quarry or sand and gravel industry.

A cost system is invaluable when a quick accounting of the business is needed. It may be necessary to borrow money from the bank. No bank will lend money on a business unless its records are complete and detailed. If you have to call in an accountant to straighten out the records of your business just before you borrow, you will find the loan very costly. In the case of a fire it is 100 per cent easier to collect insurance if one has proper records with which to back up his demands. Labor cost records are absolutely essential in determining the extent of liability and compensation insurance one has to pay. A cost system is a necessity wherever a quick accounting of the business is needed.

It must be borne in mind that one goes into business for a long time, usually for life. Whatever one does to improve the conditions of the business is done with a view to making the improvement permanent. The more complete a man's knowledge of his past experience is the better he can manage the present and estimate the future. If a man does not manage his business scientifically but blunders through it, he is sure to come to a standstill very shortly or be forced out altogether.

One of the first principles of science is that a gage or measure must be established with which progress can be reckoned. A cost system provides this gage to the operator. It sets up a standard by means of which he can tell whether he has made or lost money on one class of work. It points out where the trouble lies and what corrections should be made.

A cost system has many functions, but perhaps most important of all is the fact that it serves as a business measure. It offers the manager a picture or reflex of the business and summarizes the details for him in such a manner that his mind is easily able to grasp the entire situation. The cost system tells the owner where the money goes and also enables him, by referring to past records, to determine whether his expenditures are justifiable. The mere fact of having a gage or measure has the effect of reducing expenses because it signals unwarranted expenditure and prevents their being incurred. A cost system also tells the owner which line actually pays and how much to charge for his work in order to make a profit. A cost system serves as a check on labor. It enables an operator to determine which men do the best work. It sets up a standard by which to gage the ability of his men and it is an invaluable aid in estimating the cost of future operations because it establishes the minimum and the maximum standard of the capacity of his labor.

(To be continued)

Indiana's Concrete Roads More Costly This Year

CONSTRUCTION cost is $1000 per mile greater than last year for standard 18-ft. cement roads, according to Earl Crawford of the Indiana State Highway Commission. Stone and gravel are 10 cents a ton more, and cement 15 cents a barrel more. The producers claim that the increased cost is principally due to increased labor costs.

Nature, Preparation and Use of Pulverized Coal*

II—Relation of Air Supply to Burning. Pulverized Fuel

By Richard K. Meade
Chemical and Industrial Engineer, Baltimore, Md.

IF ALL of the heat in the coal is to be transferred to the products of combustion, it is necessary that the coal be completely burned. The two losses which occur from unburned coal are: 1. Coal which is carried out by the ashes. 2. Coal which is only half burned to form carbon monoxide instead of carbon dioxide. When carbon is burned either one of two gases may be formed according to the conditions during the burning. If a liberal supply of air is present, carbon will burn to carbon dioxide. If, however, the air supply is sufficiently restricted, carbon will burn to another gas known as carbon monoxide. One pound of carbon burned to carbon dioxide will produce 14,580 B.t.u., while one pound burned to carbon monoxide will produce only 4375 B.t.u., or a loss of about 70 per cent of the heating value of the carbon.

Relation of Air Supply to Burning

The loss of heat due to the incomplete combustion of fuel is considerable. Some loss occurs from incomplete combustion of carbon to carbon monoxide, but the greater loss is due to unconsumed carbon in the ash, as will be seen by referring to Table III (Rock Products, June 2, 1923). This loss increases as the ash increases.

In the first place, if we leave 25 per cent unconsumed carbon in the ash of a coal containing 18 per cent ash, we lose twice as much combustible matter as if we left the same percentage of carbon in one containing 9 per cent ash. The loss in the former case amounts to 7.3 per cent of the heating value of the coal and in the latter to only 3.3 per cent. In addition to this, the higher the ash, the greater percentage of carbon it is likely to contain because the ash acts as a blanket or screen to prevent the air getting to the carbon to consume it. This is particularly true if the ash is fusible and clinkers on the grate, preventing the even distribution of the air through the fuel bed. The ash from bituminous coal will frequently contain 40 to 50 per cent unconsumed carbon. In burning coal on grates, it is the usual practice to employ from 50 to 100 per cent more air than is necessary in order to insure burning of the larger part of the combustible matter.

Experiments have shown that the rate at which heat is transferred from the products of combustion to the water within the boiler is proportional to the difference in temperature between the gases and the material to be heated, other conditions remaining the same; hence the temperature of the firebox should be as high as is consistent with the life of the latter.

The greatest factor in determining the temperature which will be produced when a fuel is burned is the amount of air used for combustion. For example, when we burn 1 lb. of coal with just the quantity of air necessary for combustion, the products of combustion will weigh approximately 11 lb. If we use twice as much air as is necessary, the products of combustion will weigh 21 lb., etc. It will be readily understood that if we transfer the heat in 1 lb. of coal to 11 lb. of gas, the temperature of the latter will be very much higher than if we transfer the same quantity of heat to 21 lb. of air.

The relation between temperature produced and air used in burning is shown graphically in Fig. 3 (Rock Products, June 2, 1923). These curves show the temperature which will be produced by burning 1 lb. of carbon with varying percentages of air, and also by burning 1 lb. of bituminous coal of average heating value.

The temperature produced by the burning will not affect fuel economy so much of itself, but it does affect the cost of the boiler plant. The transfer of heat between the gases and the water is most rapid when the difference between the water and the gases is greatest. Thus the heat from gases at 3000 deg. Fahr. can be transmitted to the water at 212 deg. Fahr. much more rapidly than can that in gases at 2000 deg. Fahr. Hence, higher temperatures in the combustion chamber mean a smaller boiler; or, what is the same thing, a greater percentage or rating developed in the same boiler.

In operations such as burning lime and cement, melting iron, etc., it is absolutely necessary that the temperature shall be at least sufficient to produce the chemical or physical change desired and here the quantity of air used must be limited to a figure which will give at least the required temperature.

For practical purpose therefore the advantages of having a good temperature in the firebox is considerable. There is, however, a very much greater objection than low temperature to employing any more air for burning coal than is necessary. Some heat is always carried away by the gases leaving the kiln. This heat is proportional to the quantity and temperature of the gases. Eleven pounds of gas leaving the kiln at 400 deg. will carry off only about half of the heat which will be carried off by 21 lb. at the same temperature. Similarly 11 lb. of gas leaving at 400 deg. Fahr. will carry off only about half of the heat which it would at 730 deg. Fahr.

In burning coal therefore we are "between the devil and the deep sea," as it were. If we use too great a quantity of air, we reduce the temperature of the flame and increase materially the heat which is carried off by the waste gases. If we use too little air, we increase the coal in the ashes and form carbon monoxide instead of carbon dioxide, with a corresponding loss of heat.

In designing furnaces and other equipment for burning coal, whether it is for a boiler, a cement kiln or a lime kiln, the idea, therefore, to be kept in mind is simply that of burning coal as completely as possible and with as little air as is necessary.

Pulverized Fuel

I must ask the reader's pardon for having burdened him with this elementary discussion of the principles underlying the combustion of coal, but a clear conception of the subject is highly desirable if the objects to be accomplished by the use of pulverized coal are to be entirely understood. Any economy which is to be effected by pulverized coal must be due to the conditions which are obtained while burning.

Manifestly, it is more convenient to handle coal with mechanical stokers, or some

such device as this, rather than to go to the expense of drying and pulverizing it; hence, whatever advantage this fuel has must be due to the fact that it can be more completely burned and with less air than will be the case when firing on grates, gassifying in producers, etc.

The early history of pulverized coal as a fuel is clouded in more or less mystery and there seem to have been until the last decade very few, if any, successful attempts to employ it outside of the cement industry. However, different writers have suggested at various times during the last century that the burning of pulverized coal be employed as the most successful way of utilizing the heat of the coal.

The first recorded experiment to burn coal in a powdered form was made by Niepce in 1818 and Henckel did similar work in 1831. Crampton experimented in 1868 with powdered coal for heating a rotary puddling furnace which he invented and it was actually used for heating such a furnace at the Woolwich Arsenal, in England, in 1873. From that time on, technical literature contains much on the subject and many patents on apparatus

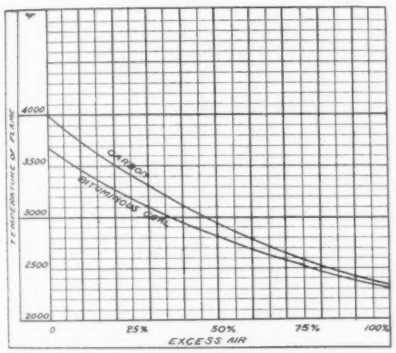


Fig. 4—Theoretical flame temperature of carbon and of bituminous coal of average composition when burned with various percentages of excess air. Theoretical air necessary for complete combustion is represented by "O"

and methods of applying it to heating various furnaces and boilers have been issued. Up to the present decade, however, the process had met with success only for the purpose of heating the rotary cement kiln.

Several metallurgists were familiar with powdered coal and some of these, notably Crampton and Sir Henry Bessemer, proposed to use it for heating metallurgical furnaces. A few copper furnaces were heated with pulverized fuel fully 20 years ago, but its use in metallurgy did not really begin until about 10 years ago, since which time it has come very prominently into use in the steel and copper industries. More recently still is its employment for steam generation. Its successful application to the vertical lime kiln is still a problem.

The writer's estimate on the annual consumption of pulverized coal is given approximately in the accompanying tabulation.

	Tons
In the cement industry	6,000,000
In the iron and steel industry	1,500,000
For the production of copper	1,000,000
For the generation of power and miscellaneous	1,000,000
Miscellaneous purposes	500,000
	10,000,000

(To be continued)

Production of Stone in 1922

THE stone produced in the United States in 1922 amounted to about 81,000,000 short tons, valued at $118,500,000, according to an estimate given out by the Department of the Interior from figures compiled by the Geological Survey. These figures show an increase of about 27 per cent in quantity and 11 per cent in value over the output in 1921. There was a good demand during the year for nearly all kinds of stone, but the production of monumental and building stone, paving blocks, curbstone, and flagstone was somewhat restricted by labor troubles, which caused the closing of quarries and cutting plants, especially at the principal granite centers in the New England states. Trouble was also experienced in getting transportation for crushed stone and other stone products. The cost of quarrying was somewhat less in 1922 than in 1921 and prices were lower.

Building stone was in good demand, as is shown by an increase of 81 per cent in the output of limestone from the Bedford-Bloomington district, in Lawrence and Monroe counties, Indiana. This large increase was not shown throughout the country, but increases in other districts in limestone, sandstone, and marble, and to a less extent in granite used as building stone, indicated a output of 23,000,000 cu. ft.—a total increase in 1922 of 35 per cent.

The stone sold for monumental work was apparently about the same as in 1921, but there was a decrease in the output of granite and an increase in that of marble.

Granite for paving blocks decreased about 20 per cent in quantity in 1922 as compared with 1921.

There was an increase in the quantity of stone sold for curbstone, flagstone, and rubble, but a decrease in the quantity of that used for riprap.

The production of crushed stone, which represents more than 50 per cent of the stone quarried, was estimated at 52,600,000 short tons in 1922, an increase of about 22 per cent. Crushed stone sold for use in road metal and in all kinds of concrete work increased about 24 per cent and stone sold for railroad ballast about 13 per cent.

The revival in 1922 of the metal-smelting industry increased the demand for stone for use as flux more than 74 per cent. The estimated quantity of stone used for this purpose in 1922 was 18,595,000 short tons.

The stone sold for use as refractory material also increased in 1922 as did the stone, chiefly limestone, sold for use in the chemical industries.

The quantity of pulverized limestone sold for use in liming farm land was estimated at 1,180,000 short tons, a decrease of 10 per cent from 1921.

According to the department, 2,417,883 tons of phosphate rock, valued at $10,828,346, was shipped from mines in the United States during 1922.

Florida, the leading state, shipped 2,058,593 tons, worth $8,347,522, more than nine-tenths of which was land-pebble phosphate. From Tennessee 353,309 tons, worth $2,107,382, was reported, including a comparatively small quantity from Kentucky, most of which was brown rock. Small shipments were reported from Idaho and South Carolina.

The Color Factor in Talc

A VERY pure white is demanded by many consumers of talc, but no standard method of detecting slight differences in color has been devised, states R. B. Ladoo, mineral technologist of the Bureau of Mines.

Practically all talc producers make a rough comparative test by the unaided eye, usually comparing talcs to a sample taken as a standard, which varies for each producer and consumer. The talc is either placed in little heaps or is spread out flat with the finger or a knife, on the hand, or on blue or white paper.

Probably the best method now in use consists of forming two small piles of the material used as a standard and of the talc to be tested, pushing the heaps close together and flattening them with a spatula so that the contact between the heaps is a smooth, straight line. If the talcs are then wet with a few drops of turpentine, slight differences in color may be detected; but even this method is not satisfactory, as no standard samples are used in common by the whole industry.

Often the accurate determination of slight color differences is of utmost importance, for color is not only an index of value but frequently is an indicator of proper methods of grinding. Poor color is not always due to impurities, but may be due to insufficient or improper grinding. Thus a yellow hue in a talc was attributed to iron, but microscopic examination proved that finer grinding would eliminate most of the objectionable tint. Finer grinding of many talcs improves the color. A uniform and standard method for color determination should be adopted.

A Study of Lime Kilns

V—Heating Chambers and Furnaces

By Arthur E. Truesdell
Consulting Engineer, Pittsfield, Mass.

FROM a chemical viewpoint, a lime kiln may be considered as an energy transformer, in which we take the potential energy locked up in the fuel, release it into sensible heat and transfer as much as possible to the limestone, which becoming dissociated locks some of it up in the lime as potential heat. The ratio of the energy locked in the lime to that present in the fuel measures the efficiency of the transformer. This term thus takes into consideration the disposition of all the energy present, whether useful or wasted.

The principal functions of a lime kiln are:

(a) The release of heat units from the fuel.
(b) The transfer of heat units to the stone.
(c) The removal of the carbon dioxide thrown out from the stone.

The conditions under which these functions take place should be as favorable as possible for each. For example, our furnace should be built and operated to release the maximum heat units from each pound of fuel consumed, and our raw material must be so placed and treated as to capture a maximum of the heat units passing by in the gases.

Vertical Heating Chambers

Limestone and lime are rough, heavy materials, requiring much hard work in their handling. It was natural, then, to prefer kilns where gravity would do some of this work. Hence the vertical shaft kiln has been the usual form as it was generally possible to secure hard raw material which would not disintegrate in the kiln. This kiln did not require a stack or fan to remove the gases, which also was an advantage. It has been built in many styles, according to the available materials and the fancy of the builder. The latest models, with tall steel stacks, cooling cones, shears, inclined hoists, etc., do not much resemble the low kilns of 50 years ago, which were built of stone, with wooden buckstays. A wooden bridge enabled a one-horse cart to dump its load of limestone into the kiln and the hot lime was shoveled out at the base by hand. One type of vertical kiln is built for feeding with limestone and fuel mixed together, introduced at the top. The more modern type has outside fireboxes.

The mixed feed kiln generally has a heating chamber with sides expanding downward at the hot zone in order to avoid bridging or sticking of the charge. Otherwise little care in design is necessary, as the fuel is directly in contact with the limestone.

With outside fireboxes, however, comes the necessity for directing the gas currents to secure uniform heating as much as possible. The resistance to the flow of the gases is less up the smooth sides of the kiln above the furnaces than it is through the mass of limestone, so there is a tendency for uneven heating.

The shape of the heating chamber (sometimes called "bore" of the kiln) varies in detail according to the ideas of the designer or method of operation. Hard burning stone is generally handled on the "stick" method, with the heating chamber slightly constricted between furnaces placed opposite one another. With easy burning stone the sides may be vertical at the hot zone in order to avoid poking. If using high-magnesium rock, the heating chamber should be of larger size than for high-calcium in order to secure the greater output, since the heat requirements are not so large per ton of stone.

It is very important to have the size and shape of the heating chamber conform to the kind of stone and method of operation. The heating chamber, being a flue placed on end, is not well adapted for uniform heating and hence the capacity of the vertical kiln with outside fires is moderate. No vertical kilns can use soft or small sized stone very successfully.

Horizontal Heating Chambers

If instead of passing the limestone through the heated zone of a vertical kiln we pass the hot zone through the limestone, we employ the Hoffman or ring type of kiln. This involves a large structure with stack or fan for draft, besides a large amount of labor for handling the limestone and lime. The heating chamber is a long endless flue divided up by temporary partitions and is not particularly adapted for rapid work, as the heating of the massive brickwork of the kiln cannot be pushed quickly and this heating is constantly going on. It can, however, burn soft stone, but not small-sized stone.

Another horizontal kiln is the so-called "tunnel" kiln, where the limestone on cars is passed through the heated zone. This also involves a large structure with stack or fan, and labor to place carefully and afterward remove the materials from the cars. It works more rapidly than the ring kiln, as the heated zone is stationary; but there is less material and volume of heat in the kiln at any one time. It can burn soft stone, but not small-sized stone. As far as the writer knows, it has never been successful on lime, although good for some high-priced articles.

Inclined Heating Chambers

The rotary kiln is neither vertical nor horizontal, but slightly inclined from the horizontal. Being a straight flue, its heating chamber is not particularly efficient as to form, although it uses radiated heat from flame to some advantage. The movement of the kiln furnishes control over the uniformity and amount of heating, which is a great advantage. It can also use soft and small-sized stone. Since it is not practical to build it in small diameters, the capacity is large.

Most Fuels Available

The shape and size of the heating chamber will determine where the furnace should be attached and how many furnaces will be needed. The fuel to be used will determine the furnace dimensions and characteristics. It may modify somewhat the heating chamber, as it is necessary that the combined structure be adapted to an efficient use of the whole as well as of its parts.

The combustion of most fuels now available, if low in sulphur, give the same gases in the products of combustion in varying amounts, and since these gases (except perhaps steam) are not active in the dissociation, such fuels can be used economically, if the furnace and heating chamber design are correct for them. The temperature, however, produced in the products of combustion of most fuels as ordinarily burned are much higher than that required to dissociate the limestone. They are, in fact, so high that such fuels cannot be successfully used unless means are taken to modify them. Otherwise, the lime is unevenly burned and of poor quality and yield.

Fuels Used and Their Combustion

Air-dried wood contains 25 per cent moisture, which is gradually set free when the wood burns. This absorbs some of the heat and also increases the volume of the products of combustion, both of which reduce the temperatures available. Wood, being a poor conductor of heat, throws off its combustible gases slowly and very evenly, thus producing flame long continued and of even volume. Under such conditions lime is burned very easily, with little care and of good quality; although the efficiency of its combustion is not high, for excess air is present with more or less waste of fuel in smoke. Wood has been the favored fuel of the lime manufacturer for centuries, being generally easily obtained and cheap.

Producer gas, being of low calorific value, produces a comparatively low temperature in the products of combustion, so that the danger of overheating the lime is no more than with wood and the lime made with it is of excellent quality. For efficiency it requires a large combustion space. Generally burned without pre-mixing or any control over the combustion, there is often a loss in waste of fuel. As the losses incident to the producer are unavoidable, care should be exercised to secure efficient handling and burning. The gas flues should be short in order to minimize the radiation therefrom, and means worked out for pre-mixing with air. If the heating chamber is adapted to it, luminous flame with primary and secondary air may be employed so as to utilize heating by radiation.

When properly used, fuel oil makes an excellent fuel for lime burning. The oil must be heated to render it free flowing. It is then atomized and volatilized before mixing with the air for combustion. Premixing cannot be easily obtained and so a small amount of excess air is present in the products of combustion. The combustion chamber should be carefully designed and may need recirculating baffles to minimize the use of excess air. As the temperature of the products of combustion is liable to be too high for the limestone, it may be necessary in vertical kilns to lower it by some form of dilution of the gases, which in general is not efficient though practical.

Pulverized coal has not been used to any extent for burning lime, as the manufacturers have been fearful of contaminating the lime with ash. There seems to be no good reason why excellent results may not be had from a heating standpoint and when investigated ash contamination is seen to be very slight in any case. Efficient combustion means high temperatures so that for use in vertical kilns considerable excess air or steam must be introduced to modify them, which, of course, kills the efficiency, although the economic results may justify the process.

Coal is generally burned on a grate with some modification in operation to restrain the temperature of the products of combustion. Volatile coals are favored with dilution of the gases. To accomplish this, steam is introduced under or over the grate, or water sprayed on the burning fuel. The Eldred process dilutes the gases with carbon dioxide and nitrogen. All these diluents delay the mixture of fuel and oxygen, producing in most cases a long flame. Sometimes a mixture of volatile coal and wood is used.

(To be continued)

Jury Fails to Find Gravel Monopoly

AFTER hearing evidence for eight days on the alleged violation of the State Anti-Trust law by five Buffalo, N. Y., corporations and three individuals the Supreme Court jury rendered a verdict on June 6 that "no monopoly exists here in the production and sale of river sand, grit and gravel." This was after a deliberation of but four hours.

It was the initial trial on indictments arising from the investigation by the Lockwood Housing Committee in June, 1921. There are pending indictments on a similar charge involving nearly 100 individuals and corporations engaged in the lumber, brick and mason supplies business.

The defendants acquitted were the Buffalo Gravel Corp., Empire Limestone Co., Perry-Victoria Sand Co. Niagara Sand Corp., and Squaw Island Sand and Gravel Corp., Samuel J. Dark, Daniel E. Knowlton and James E. Carroll. Each individual defendant is an officer of the Buffalo Gravel Corp. and of one of the other firms.

In view of the mass of evidence introduced the verdict was reached in a comparatively short time. The actual deliberations consumed not more than three hours. Several ballots were taken but it did not require much argument, apparently, to sway the opinion of the jurors into unison. It was the contention of the prosecution that by reason of a contract entered into in March, 1919, the defendants created a situation whereby they had power to control a substantial amount of material essential to the building industry of Buffalo and its vicinity.

The defense admitted that the four producing firms had formed a fifth corporation to pool their handling and selling agencies but denied that thereby they had created a monopoly. They proved to the satisfaction of the jury that they had not the power to restrain competition in gravel production.

The action of the jury was awaited with much interest because of developments during the Lockwood Committee hearings here in 1921. Samuel Untermyer, counsel for the committee, at that time asserted that the contract itself was proof of a violation of the Anti-Trust law. The gravel case, consequently, was regarded as the strongest from the prosecution's viewpoint of those which resulted from the legislative committee's session.

Newaygo Cement Co. Issues $1,500,000 Bonds to Finance Its Manitowoc Plant

THE Newaygo Portland Cement Co., of Newaygo, Mich., has placed on the market a $1,500,000 first mortgage 15-year sinking fund 6½ per cent gold bond issue to finance a subsidiary plant of 3000-bbl. capacity at Manitowoc, Wis., the Manitowoc Portland Cement Co.

This closed bond issue will be secured by direct first mortgage upon the Newaygo plant and by pledge of all the first mortgage bond issue of $1,500,000 of the Manitowoc company.

The Newaygo properties are appraised at $1,324,189.25. The estimated cost of the Manitowoc plant is $2,010,000, giving total assets of more than twice this issue. The average net earnings of the combined properties are estimated in excess of $600,000, or more than six times the maximum interest charges.

In the past 10 years the Newaygo company has paid $772,271 in cash and $64,416 in stock dividends from earnings and $500,000 stock dividends from capital surplus.

The ownership and management of the company includes the following:

Clay H. Hollister, president of the Old National Bank of Grand Rapids; J. B. John, a leader in the development of the portland cement industry; Fred Vogel, Jr., chairman of the First Wisconsin National Bank, Milwaukee; H. D. Higginbotham, Joliet, Ill.; W. D. Stevens, Mrs. D. McCool, and P. H. Travis, Grand Rapids, Mich.; E. Gunnell, Charles C. West and L. E. Geer of the Manitowoc Ship Building Corp.; George Vits, president, and Dr. A. J. Vits, vice-president of the Aluminum Goods Mfg. Co.; Louis Schuette, president, and Edwin Schuette, cashier, Manitowoc Savings Bank; Peter Reiss of the C. Reiss Coal Co., Manitowoc; J. W. Alder, president of the American Sand and Gravel Co., Chicago; Frank W. Renwick, president, Chicago Gravel Co.; H. W. Thorp, president, Goodrich Transit Co., and Thomas J. Prindiville.

New Era Opens to Lime Industry

New York Convention Splendid Testimony to Associated Efforts. Charles Warner Resigns and George B. Wood Is Elected President

THE fifth annual convention of the National Lime Association and the twenty-first annual meeting of American lime manufacturers is ample evidence that the lime industry of the United States has indeed attained its majority and has reached the full bloom of manhood. Every prospect points to the successful fulfillment of the long-sought search for a quick-setting lime plaster and the successful use of lime in the manufacture of building blocks and tile of qualities and properties to compete with clay and gypsum building products.

As President Charles Warner, who has guided the association through its most perilous period, said, associated effort must always be slower in results than individual efforts and the accomplishments of the National Lime Association during the last year are things that will bear fruit not this year or next, but 10, 20, and 50 years hence. The lime industry of America—probably the lime industry of the world

Charles Warner, who has resigned as president

—is far more indebted to Charles Warner for his work as the directing genius of all this development than it will realize for the same 10, 20, or 50 years. Some appreciation of his efforts was evidenced by the members of the association in the presentation to the retiring president of a handsome silver tea set.

The president-elect, George B. Wood, president of the Rockland and Rockport Lime Corp., is a worthy successor and comes to his office with one of the finest association organizations ever developed.

George B. Wood, the president-elect

Unfortunately, W. R. Phillips, general manager, whose work in connection with the great strides made by the lime industry is second only to that of President Warner, is leaving the organization to join the staff of the American Lime and Stone Co., of which Charles Warner is president.

The new era which President Warner has so auspiciously ushered the National Lime Association into, offers possibilities far beyond the dreams of lime manufacturers of a generation ago. It will make lime a corner-stone in agriculture, in construction, in the industries. Many details remain to be worked out before much that has been developed will be commercially applied, but under the leadership and guidance of such able scientific men as Dr. M. E. Holmes, chemical director, and other members of the association staff, what is accomplished is based upon scientific truth and is the result of accurate technical knowledge which will surely lead to far greater accomplishments.

A full report of the convention will appear in the June 30 issue of Rock Products.

Sand, Gravel and Stone Loading Breaks All Records

THE official records of the American Railway Association show for the week ending May 12 that 46,242 cars of sand, gravel and stone were moved by the railroads, says the *National Sand and Gravel Bulletin*. So far as available statistics show, this is the largest movement of sand, gravel and stone in a single week in the history of the railroads. The previous record was established during the week ending July 29, 1922, when 45,639 cars were moved.

The loading during the week ending May 12 is even more impressive when it is considered that the cars moved represented only 88 per cent of requirements. Had the carriers furnished a 100 per cent car supply,

W. R. Phillips, who leaves the association to join the staff of the American Lime and Stone Co.

55,364 cars of material would have been moved during the week. These figures serve to illustrate that business conditions within the industry as a whole are excellent, and it emphasizes the fact that the recent publicity designed to discourage building activities has not had any depressing effect upon demands for materials.

Linseed Agreement Is Held Unlawful

Supreme Court Rules Again on "Open Price Association" and the Sherman Act

"OPEN price associations" again were declared unlawful by the United States Supreme Court at Washington, D. C., on June 4, when that body, in an opinion delivered by Justice McReynolds, held that such an association between linseed crushers was a violation of the Sherman act. The decision follows that against the Hardwood Lumber Association, made some time ago, when the court ruled such an agreement outside the law.

The District Court for the Northern District of Illinois has held that the combination of the linseed oil crushers was lawful and had dismissed a bill of complaint brought by the government, but the Supreme Court on June 4 overthrew the decision of the lower court.

The defendants were the American Linseed Oil Co. et. al., comprising 12 corporations, in six different states, which manufacture and distribute linseed oil cake and meal, and Julian Armstrong, who operates at Chicago under the name of Armstrong Bureau of Related Industries.

"This bureau," said Justice McReynolds, "conducts a so-called 'exchange,' through which one subscribing manufacturer may obtain detailed information concerning the affairs of others doing a like business. The defendant 'crushers' constitute one of the groups who contract for this service.

"They manufacture and distribute throughout the Union a very large part of the linseed products consumed therein, and prior to the challenged combination were active, unrestrained competitors. Some time in September or October, 1918, each of them entered into an identical written 'subscription agreement' with the Armstrong bureau, and a year thereafter signed another, not essentially different."

According to the description by Justice McReynolds, under the agreement signed by the linseed crushers with the Armstrong bureau, the crushers were to secure through the bureau the following things:

Comprehensive data as to market, trade and manufacturing conditions in the linseed oil industry.

Economies in manufacture and sale by frank exchange of accurate information.

The latest authentic information concerning the credit of buyers.

A broader market for cake and meal.

Establishment of uniform cost accounting systems.

Fair and just frieght tariffs and classifications.

Definite standardization of the products of the industry.

Economies in the development of foreign markets and increase of sales therein.

Stabilization of the flaxseed market so far as lawful.

Shipment of cake and meal to the consumer from the nearest point of production.

The crushers agreed, Justice McReynolds found, to turn over to the bureau the full reports of all sales, quotations, offerings and other information required.

"The obvious policy," said Justice McReynolds, "indeed, the declared purpose of the arrangement was to submerge the competition theretofore existing among the subscribers and substitute 'intelligent competition' or 'open competition,' to eliminate 'unintelligent selfishness' and establish '100 per cent confidence,' to the end that the members might 'stand out from the crowd as substantial co-workers under modern co-operative business methods.'

"In American Column and Lumber Co. vs. United States, we considered a combination of manufacturers got up to effectuate this new conception of confidence and competition and held it within the inhibition of the Sherman act because of the inevitable tendency to destroy real competition, as long understood and thereby restrain trade. Our conclusion there cannot be reconciled with the somewhat earlier opinion and judgment of the court below, they are in direct conflict.

"The Sherman act was intended to secure equality of opportunity and to protect the public against evils commonly incident to monopolies and those abnormal contracts and combinations which tend directly to suppress the conflict for advantage called competition—the play of the contending forces ordinarily engendered by honest desire for gain.

"Certain it is that the defendants are associated in a new form of combination and are resorting to methods which are not normal. If, looking at the entire contract by which they are bound together, in the light of what has been done under it, the court can see that its necessary tendency is to suppress competition in trade between the states the combination must be declared unlawful. That such is its tendency, we think, must be affirmed."

Referring to the operations of the defendants he said:

"Each subscriber agreed to furnish a schedule of prices and terms and adhere thereto—unless more onerous ones were obtained—until prepared to give immediate notice of departure therefrom for relay for the bureau. Each also agreed, under penalty of fine, to attend a monthly meeting and report upon matters of interest to be there discussed, to comply with all reasonable requirements of the bureau and to divulge no secrets.

"In the absence of a purpose to monopolize or the compulsion that results from contract or agreement, the individual certainly may exercise great freedom, but concerted action through combination presents a wholly different problem and is forbidden when the necessary tendency is to destroy the kind of competition to which the public has long looked for protection."

Progress on Roads as Season Opens

THE 1923 road-construction season opens with the prospect that there will be about the same amount of road construction as last year, which was a very satisfactory one, according to the Bureau of Public Roads.

Returns from 21 scattered states show that there will be available $288,000,000 for road work as compared with $273,000,000 spent in the same states last year. On Federal-aid work, which constitutes something like half of the total construction, there was under construction on March 31 work estimated to cost $258,000,000 as compared with $233,000,000 12 months previous.

Wages of labor are generally slightly higher than a year ago, with the exception of the Pacific coast, where the same rate prevails. The greatest increase is in New England, where the present level is approximately 30 per cent higher than the level of a year ago.

The general outlook is considerably better than one year ago, when the railroad and coal strike loomed as disturbing factors. Added to this is the fact that the designation of the system of Federal-aid highways is now completed in 33 states and practically complete in most of the others. With a definite program for accomplishment laid out work can proceed much more smoothly.

From latest reports it appears that 30 states now tax gasoline as compared with 4 states at the beginning of 1921. Most of the revenue derived goes for road purposes, and bureau officials regard this as a step in the right direction. With road users paying a more equitable share of the cost, highway finance is placed upon a firmer foundation.

"Let's Sell 25 Per Cent More Slate in 1923"

THIS is the title of Bulletin No. 6 recently issued by the National Slate Association. According to the United States Geological Survey figures, 1922 was 25 per cent better than 1921—so it can be done, claims the association. Above are the sales for 1922.

SLATE SALES 1922

	Units		Remarks
Roofing slate, squares	479,243	$4,169,761	Largest number squares sold in last five years, but only one-third of largest year
Electrical slate, square feet	1,363,300	996,322	30 per cent below 1920
Structural and sanitary, square feet	2,131,800	750,653	30 per cent below 1918
Blackboard, square feet	3,518,700	880,985	11 per cent above previous years
School slates, pieces	2,766,610	42,027	25 per cent below 1921 and 35 per cent below 1920
Billiard table tops, square feet	383,900	141,445	16 per cent below 1921
Grave vaults, square feet	400,100	87,763	25 per cent below 1921
Slate granules, short tons	379,980	2,177,061	55 per cent more tonnage than 1920
Miscellaneous uses, short tons	5,500	30,767	16 per cent below 1920
Total		$9,176,784	

"As all but two items show more units sold in some recent year the 25 per cent goal of more slate sales for 1923 is attainable. *It will pay to sell more slate!*

"The overhead cost per unit goes down and the profit goes up with every sale made beyond the point where sales just pay expenses, and expenses cover all overhead, depreciation, taxes, salary to operating officers of company, etc. One member increased his production and sales in 1922 the average the industry—25 per cent—and doubled his profits!

"Make it twelve millions of slate sales in 1923 and count up your returns. Urge your customers—slate contractors and dealers—to co-operate with the association advertising and—sell more slate!"

Why Use Old Quarries?

A WASHINGTON dispatch to a St. Louis newspaper states: "Artificial earthquakes, produced by the detonation of thousands of pounds of high explosives, will shortly be created by Dr. Charles E. Munroe, explosive chemist of the Bureau of Mines, it was announced here recently.

"At selected locations, in old quarries and mines, charges of known size will be exploded and the earth tremors produced will be recorded by seismographs placed at stated distances from the explosions. The experiments are expected to furnish valuable data concerning the earthquake phenomena.

"A secondary purpose of the experiments is the establishment of a 'table of distances' for the safe handling of explosives near human habitations.

"The distribution of millions of pounds of TNT, dynamite and picric acid from the War Department's surplus stores to state and municipal agencies led the bureau to order the experiments to determine the safest method of handling the explosives."

The question immediately arises, "Why use abandoned quarries and mines? The same results might be attained in making the blasts do useful work.

Cleave Appointed Manager to Car Service Division

E. J. CLEAVE has been appointed district manager of the Car Service Division, American Railway Association, with headquarters at 30 Vesey street, New York City. He will have authority in New York, New Jersey, Delaware, Pennsylvania, Maryland and Virginia.

Missouri Highway Commission to Ask Bids on Five-Year Basis

THE Missouri Highway Commission has authorized State Highway Engineer B. H. Piepmier to advertise for bids on cement, sand and gravel and crushed stone for a five-year period.

Chairman Gary of the commission states: "The commission hopes to receive bids which will give relief from the present high prices. This five-year basis should give more satisfaction to both the state and the plant owner. The material would be purchased by the state and then sold to the contractor.

While the 1921 legislature appropriated $2,000,000 for a state cement plant, the recent legislature failed to renew the appropriation.

American Lime and Stone Co.'s New General Offices

"A PLANT ahead of its time," was the caption of ROCK PRODUCTS' article in the June 17, 1922, describing the plant of the American Lime and Stone Co., at Bellefonte, Pa.

And today, without any invidious comparisons and still keeping in mind several of the plant offices editors have visited in times past, we present some illustrations of the new offices of the American company—offices, in many respects, that are "ahead of their time."

To get the best results, it is undoubtedly true that the executive "plant" of a lime company must be in keeping with its developments in the quarry, in its machinery

The new main office building of the American Lime and Stone Co. at Bellefonts, Pa.

The general manager's office

The general superintendent's office

The accounting department

The general sales office

Showing stairway and telephone exchange

The chemical laboratory

and equipment, in "handling its output in a straight line from the mine to the loaded freight car." This is the plan carried out in these new offices.

A glance at the exterior of this building will suffice to give one a true impression of its gratifying appearance and its utility as an office structure. It is of pleasing colonial design and planned to house the business and executive departments.

The sales department is located on the ground floor. Here also are the general superintendent's office, the chemical laboratories and the telephone exchange. The view taken from the front door shows the information desk and the broad stairway leading to the second floor. Charles A. Morris, the general superintendent, has a cozy, inviting office on this floor, free from the ordinary interruptions and distractions.

On the second floor are the cost and accounting departments and the general manager's office. This office has been made sufficiently large to accommodate itself to company conferences and committee meetings. The cost and accounting departments are well lighted and there is ample room for the employes — nothing cramped or crowded as is frequently the case in the ordinary offices.

The drafting room and the engineer's office are on the third floor.

In the basement are the girls' rest-room and the chemical laboratories. On this floor there is also a room fully equipped to make experimental batches of lime, mortars, putties, etc. The laboratory is well lighted and fully equipped for tests necessary for a complete chemical control.

Recent I. C. C. Decisions

Rates on Fluxing Limestone—An award of reparation has been made in No. 12951, John A. Roebling's Sons Co. vs. Western Maryland et al., on a finding that the rates on fluxing limestone from Bittinger and Swatara, Pa., to Roebling, N. Y., were unreasonable.

The complainant sought reparation to the basis of the subsequently established rate from Bittinger and $2 per long ton from Swatara. At the hearing the complaint covering shipments from Swatara was amended to ask reparation only to the basis of a rate of 14.5 cents on shipments moving both before and after August 26, 1920, and to withdraw a prayer for a reasonable rate for the future.

The Commission found that a reasonable rate from Swatara would have been 10.5 cents prior to August 26, 1920, and 14.5 cents on and after that date and that the rates charged from Swatara were unreasonable at least to the extent that they exceeded 14.5 cents and that reparation should be made to that basis. As to the rates from Bittinger, the Commission found they were unreasonable to the extent that they exceeded $2.20 per net ton prior to August 26, 1920, and $3.08 per net ton on and after that date and that reparation should be made to those bases.

Ohio Road Material Rates—A finding that the Ohio Public Utilities Commission rates on sand, gravel, crushed stone and vitrified paving block, prescribed July 19, 1921, unjustly discriminate against interstate commerce has been recommended by Examiner Bardwell in a report on No. 14252. He said the Commission should find that the discrimination can and should be removed by requiring the railroads to establish rates, intrastate, on the basis of 115 per cent of the rates in effect immediately prior to August 26, 1920, and that where there are separate rates in effect on silica or molding sand, such rates should be reduced to amounts equivalent to 126 per cent of the rates in effect immediately prior to that date.

Quarry Road a Carrier—In a report on the case of the Ohio Quarries Co. vs. the New York Central et al., Examiner Hunter proposes that the Commission shall find the rates on stone from South Amhurst, Ohio, not unreasonable nor unduly prejudicial. He said it should also find the Lorain & Southern, owned by the quarries company, is a common carrier which lawfully may receive reasonable compensation from its trunk line connections for services rendered in connection with interstate shipments in the form of limited absorption of its switching charge of $6.75 per car.

Sand Advice Condemned—The Commission in a report on I. and S. No. 1714, sand from points in Kansas to Arkansas, Kansas, Missouri and Oklahoma, has condemned the attempt of the St. Louis-San Francisco to increase the rates on sand from Kansas producing points, to destinations on its rails in the states named. The proposal was to make rates from Turner, Munice, Flag-Mine and Grintner, Kansas shipping points, to destinations in the states mentioned one cent per 100 pounds over the rates from Kansas City. The points of Origin are just beyond the Kansas City switching limits, the distance varying from a few hundred feet to as much as 6.37 miles. The last mentioned distance was that reported by the Frisco, as applicable to Munice. The protestants did not agree upon the distance of Munice from the switching limits, estimating it from 1.5 to 4 miles. The increase would have put the sand operators just outside of Kansas City at a disadvantage of 20 cents a ton in comparison with those inside the limits. The Commission said that that difference in prices would be sufficient to eliminate from the markets in question the shippers just outside of Kansas City.

In justification for the proposal the Frisco said the Kansas City rate was not intended to cover anything more than a single line haul and that it was too thin to permit it to make an allowance of 1.3 cents to its connections on the traffic in question. The Commission said the difference in transportation conditions was not such as to permit any difference in the rates and that in prior cases it held the rates should be the same from all the producing points in and in the vicinity of Kansas City.

Union Rock Co. Building Huge Bins to Overcome Car Shortage

IN an effort to facilitate the handling of its products, the Union Rock Co., Los Angeles, Calif., is building huge bins throughout the Los Angeles district and developing a fleet of trucks for delivery use.

Twenty bins in all will be built, several of which are already in use. The company has a daily output of 15,000 tons, with a storage capacity of 11,000 tons in four bins located in the district. The new bunkers under construction have a capacity of 3000 tons each.

President Rogers says: "We are now using 250 trucks and will add more as the bins are completed. In our district the average haul has been reduced to 2½ miles." The bins will cost approximately $75,000 each. Our company expects to handle a total of 60,000 cars, or 3,000,000 tons of gravel, sand and rock this year."

Certain-teed Corporation Takes Over the Acme Cement Plaster Mills

FORMAL transfer of the Acme cement plaster mills at Acme, near Quanah, Texas, has been made by Sam Lazarus of St. Louis and associates to the Certain-teed Products Corp. of New York.

A deed of trust has been filed covering 199 pages, made by the Certain-teed corporation in favor of Walter S. Klee, trustee. This document secured an issue of $8,000,000 of first mortgage bonds.

It is stated that the new owners of the cement and plaster mills will make enlargements of the plant and increase development operations generally.

Car Loadings Pass the Million Mark

A TOTAL of 1,014,029 cars were loaded with revenue freight during the week ending May 26, according to the American Railway Association. This total is not only the largest loading ever reported for any one week at this season of the year, but has been surpassed only twice before in any year in history.

Rates on Missouri Limestone Ordered Reduced

INTRASTATE freight rates in Missouri on agricultural limestone are ordered reduced by the Public Service Commission effective June 15. The reduction varies from 1 to 25 per cent, based on the mileage, according to C. B. Bee, rate expert of the commission.

The order for the commission is supplementary to the matter under investigation by the commission on intrastate freight rates on chats, gravel, sand, stone, other road building materials and agricultural limestone. After numerous hearings the evidence found by the commission shows that the rate on agricultural limestone should be lower than on crushed road building commodities, according to the order.

The rates fixed by the commission apply to railroad lines moving within the state under one management. It is provided that for shipments moving on two or more lines not under the same management the rates shall be determined by adding 20 cents a ton to the single line rates.

The single line rates fixed by the order vary from 50 cents a ton for 40 miles, 90 cents a ton for 100 miles, $1.15 a ton for 150 miles, $1.35 a ton for 200 miles to $1.55 a ton for 250 miles.

Traffic and Transportation

By EDWIN BROOKER
Munsey Building, Washington, D. C.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning June 11:

Central Freight Association

6545. Molding Sand, Patoka, Ind., to C. F. A. territory. Illustrations:

Proposed—To Adrian, Mich., $2.52; Auburn, Ind., $2.14; Belvidere, Ill., $2.40; Bowling Green, Ohio, $2.65; Butler, Ind., $2.52; Cairo, Ill., $1.76; Converse, Ind., $1.89; Decatur, Ind., $2.14; DeKalb, Ind., $2.40; Dundee, Mich., $2.52; East Moline, Ill., $2.65; Findlay, Ohio, $2.52; Freeport, Ill., $2.40; Geneva, Ill., $2.27; Grand Rapids, Mich., $2.52; Hartford City, $2.27; Hoopeston, Ill., $1.70; Jackson, Mich., $2.52; Kalamazoo, Mich., $2.52; Kokomo, Ind., $1.89; LaPorte, Ind., $2.14; Logansport, Ind., $1.89; Michigan City, Ind., $2.14; Moline, Ill., $2.65; New Castle, Ind., $1.89; North Manchester, Ind., $2.14; Peru, Ind., $2.14; Piqua, Ohio, $2.27; Rockford, Ill., $2.40; Rushville, Ind., $2.02; South Haven, Mich., $2.52; Sterling, Ill., $2.65; Three Rivers, Mich., $2.52; Upper Sandusky, Ohio, $2.65; Warsaw, Ind., $2.14; Washington, Ind., $1.40; Princeton, Ind., $0.70.

6547. Crushed Stone and Screenings, Kenneth, Ind., to Nappanee, Milford Junction and Syracuse, Ind.; present, $1.50 to Napanee and Milford Junction and $1.61 per net ton to Syracuse; proposed, $1.15 per net ton.

6549. Crushed Stone, St. Paul, Ind., to Rushville, Bennetts and Milroy, Ind.; present, 76 cents to all points except Milroy, 75 cents per net ton; proposed, 70 cents per net ton.

6556. Lime, common, hydrated, quick or slaked, in bags, barrels, iron drums or bulk, minimum weight 36,000 lb., points of origin mentioned in Item 1485C, C. F. A. L. Trf. 130N to C. F. A. territory and Canada. Present, as published in aforesaid item; proposed, 83.33 per cent of local sixth class rates in lieu thereof.

6559. Sand and Gravel, Mt. Vernon to Delaware, Ohio; present, 14 cents; proposed, 80 cents per net ton.

6560. Sand and Gravel, Bangs to Gambier, Howard and Millersburg, Ohio; present, 9 cents to Gambier and Howard and 12 cents to Millersburg; proposed, 60 cents to Gambier and Howard and 70 cents per net ton to Millersburg.

6565. Sand, points in Indiana to Fort Wayne, Ind., per net ton.

	Present	Proposed
*From Wolcottville, Ind., to Fort Wayne	$0.63	$0.55
*From Winona Lake, Ind., to Fort Wayne	.63	.55
‡From Pleasant Lake, Ind., to Fort Wayne	.63	.55

*Applies from tracks of the Pennsylvania to deliveries on that railroad at Fort Wayne.

‡Applies from tracks of the N. Y. C. to deliveries on that railroad at Fort Wayne.

6566. Sand and Gravel, Pleasant Lake, Winono Lake and Wolcottville, Ind., to Lima, Ohio; present, $1.27, $1.01, $1.10 per net ton; proposed, 90 cents per net ton.

6567. Sand (blast, engine, foundry, glass, molding and silica), Louisville, Ky., New Albany and Jeffersonville, Ind., to C. F. A. territory. Present, as published in agency and individual lines issues. Proposed illustrations, from Jeffersonville and New Albany, Ind. Rates from Louisville to be made by adding 13 cents per ton to the rates named herein from Jeffersonville, except to points marked "*," which will be the same as from Jeffersonville, Ind., and New Albany, Ind. (per net ton): To Abingdon, Ill., $2.90; Alverdton, Ohio, $2.65; Arfos, Ind., $2.27; Bay City, Mich., $3.78; Belpre, Ohio, $3.15; Britton, Mich., $2.65; Carbondale, Ill., $2.65; Centralia, Ill., $2.27; Clyde, Ohio, $2.90; Connorsville, Ind., $1.89; Crawfordsville, Ind., $2.27; Deshler, Ohio, $2.39; *Dunkirk, N. Y., $4.41; East Dubuque (proper), Ill., $3.28; East Louisiana (proportional), Ill., $2.52; Elizabeth, Pa., $4.41; Fairmont, W. Va., $4.81; Findlay, Ohio, $2.39; Galesburg, Ill., $2.90; Grand Rapids, Mich., $3.15; Green Valley, Ill., $2.27; Hamilton, Ohio, $2.02; Hoopeston, Ill., $2.27; Huntington, W. Va., $3.78; Kendalville, Ind., $2.65; Kokomo, Ind., $2.27; LaOtto, Ind., $2.65; *Leckrone, Pa., $4.81; Ludlow Falls, Ohio, $2.27; Mansfield, Ohio, $2.90; *Martins Ferry, Ohio, $4.41; Middletown, Ohio, $2.02; Mitchell, Ind., $1.51; *New Brighton, Pa., $4.41; New Ross, Ind., $2.27; Oak Harbor, Ohio, $2.90; Osborn, Ohio, $2.02; Parkersburg, W. Va., $3.78; Phalanx, Ohio, $3.15; Pomeroy, Ohio, $3.15; Quincey, Ohio, $2.27; Roachdale, Ind., $2.27; Salem, Ohio, $3.15; South Charleston, Ohio, $2.02; Tecumseh, Mich., $2.65; Upper Sandusky, Ohio, $2.39; Vermillion, Ohio, $3.15; Warren, Pa., $4.41; *Wheeling, W. Va., $4.41; Ypsilanti, Mich., $2.65.

6573. Cement (common or natural, hydraulic and portland), St. Louis, Mo., to Vaughan and Rahm, Ind.; present, 18 cents; proposed, 13½ cents.

Illinois Freight Association

593A. Sand and Gravel, carloads, minimum weight 90 per cent of marked capacity of car, 63 cents per net ton from Cowling, Ill., to Carmi, Ill.

1850. Sand and Gravel, carloads, minimum weight 90 per cent of marked capacity of car; proposed switching rate of $10 per car from McGrath gravel pit at Steele, Ill., to Wabash connection at same point (Steele, Ill.), subject to rules currently in effect in connection with switching rates.

1851. Sand and Gravel, carloads, minimum weight 90 per cent of marked capacity of car, 98 cents from Moronts to Joliet, Ill., 84 cents to Minooka, Seneca, Marseilles, Ottawa, LaSalle, Peru and Marquette, Ill., and 88 cents to Chillicothe and Peoria, Ill.

1852. Sand, Gravel, Sand Pit, Strippings and Gravel Pit Strippings, carloads, minimum weight 90 per cent of marked capacity of car, $1.26 per net ton from Hammond, Ill., to Dubuque, Ia.

1862. Sand and Gravel, C. L., minimum weight capacity of car, $1 per net ton from Forreston to Nelson, Normandy and Manlius, Ill., $1.10 to Buda, Morse and Broadmoor, Ill., $1.30 to Camp Grove and Limestone, $1.40 to Peoria, Chicago and Melrose Park, $1.30 to Proviso, Elmhurst, Lombard, Wheaton, West Chicago, Geneva and LaFox, etc.

1868. Sand and Gravel, C. L., minimum weight 90 per cent of marked capacity of car, 70 cents per net ton from Steele, Ill., in connection with Wabash railroad to following points on that line in Illinois: New Lenox, Alpine, Palos Park, Chicago Ridge, Oak Lawn, Marley, Orland, Worth, Ashburn, Landers and Chicago.

Note: Rate to Chicago to be confined to Wabash delivery.

New England Freight Association

4758. Limestone (ground), minimum weight marked capacity of car except when cars are loaded to cubical or visible capacity actual weight will apply, but not less than 40,000 lb., from West Stockbridge, Mass., to Rome, N. Y., 19 cents. Reason: Equalization of rates with those in effect to more distant points.

Southern Freight Association

10031. Cement, C. L., from Kingsport, Tenn., to Cincinnati, Ohio, Newport and Covington, Ky.; present rate, 15½ cents per 100 lb.; proposed rate, 17 cents per 100 lb., same as rates in effect from Kingsport to Lexington, Ky., also same as rate concurrently in effect from Richard City, Tenn., to Cincinnati-Louisville group.

10177. Stone (broken or crushed), C. L., from Franklin to Whitehead to Memphis, Tenn. Present rates: From Franklin, $1.35 per net ton; from Whitehead, $1.53 per net ton. Proposed rate, from Franklin, $1.32; from Whitehead, $1.55 per net ton.

10198. Lime, C. L., minimum weight, 50,000 lb., from Knoxville to Kingsport, Tenn.; present rate, $2.37 per net ton, C. L. minimum weight 30,000 lb. (Johnson City, Tenn., combination); proposed rate, $1.95 per net ton.

10210. Crushed Stone, C. L., minimum weight 50,000 lb., from Carter's Creek, Tenn., to Goodrich, Tenn.; present rate, 45 cents per 100 lb., or $9 per net ton; proposed rate, $1.50 per net ton, applicable on intrastate traffic only.

Southwestern Freight Bureau

8568. Cement, Etc. To establish the following rates in cents per 100 lb. on portland, hydraulic and paving cement in straight or mixed carloads, minimum weight 50,000 lb., to Cove Creek, Ark., from Chanute, Kan., Wewey, Okla., and other points taking same rates as shown in S. W. L. Trf. 90D, 23½; Ada, Okla., 20½; Harrys and Eagle Ford, Tex., 24½; Bonner Springs, Kan., Kansas City, Mo., and Sugar Creek, Mo., 26; St. Louis, Mo., East St. Louis, Ill., Continental, Mo., and Prospect Hill, Mo., 21½; Cairo and Thebes, Ill., 20; Memphis, Tenn., 17; Cape Girardeau, Mo., 20; Hannibal, Mo., 26½. Remarks—It is claimed that this traffic is needed in the construction of water dams and hydroelectric development and that in view of its close proximity to Malvers it should be entitled to the same rate as to that point.

8576. Cement. To establish rate of 20½ cents per 100 lb. on cement, carloads, minimum weight 50,000 lb., from Harrys and Eagle Ford, Tex., to L. R. & N. stations Almedia to Schrewsbury, La., inclusive. Remarks—It is claimed that the proposed adjustment is necessary to place the L. R. & N. stations referred to on a parity with other points on that line.

8623. Cement, Etc. To amend Item 960 of S. W. L. Territorial Directory No. 1F to include cement, carloads, with the other commodities, the effect of which will be to establish the Peoria rates from Utica, Ill., to Oklahoma points in lieu of the Chicago rates now applying. Remarks—It is contended that the Peoria rates should be established on this commodity from Utica, as Peoria rates are now applicable from Utica on analogous articles, such as brick, sand, etc.

Trunk Line Association

11396. Cement (common, hydraulic, natural and portland), C. L., minimum weight 50,000 lb., Allentown, Atlantic Mills, Bath, Bath Junction, Catasauqua, Chapman, Egypt, Evansville, Lesley, Martin's Creek, Nazareth, Northampton, Ormrod, Penn Allen, Sandt's Eddy, Saylor, Stockerton and West Coplay, Pa., to Bauldauf Mine, Carrier, Clarion, Elss, Gordontown, Harlan, Henderson, Holden, Stratonville and Waterson, Pa., 17½ cents per 100 lb.

11404. Cement (common, hydraulic, natural, or portland), C. L., minimum weight 50,000 lb., except when for carriers' convenience cars of less capacity are furnished, in which case minimum weight will be the marked capacity of car furnished, but in no case less than 40,000 lb. from Lehigh District to all stations on Stewartstown railroad, 16 cents per 100 lb.

11407. To publish same rates from Kenney Yard, Pa., on sand and gravel as now in effect from Thompson, South Duquesne and McKeesport, Pa., to points on the Pennsylvania railroad, as shown in Trfs. G. O. I. C. C. 11918 and G. O. I. C. C. 10638.

Western Trunk Line

3163. Lime, C. L., from Springfield, Mo., to points on the Wichita Northwestern. Present, combination rates using Wichita Northwestern locals beyond junctions. Mo. Pac. rate to Iuka and Larned, Kan., is 31 cents per 100 lb. The same rate is published to A. T. & S. F. stations Pratt, Belpre and Kinsley, Kan. Proposed, to publish a rate of 31 cents for 100 lb., minimum weight 30,000 lb., to all stations on the W. N. W.

2269-B. Sand (molding), C. L., from Dallas City, Lomax and Jaynes Spur, Ill., to Waterloo, Ia.; present, full Class E rate; proposed, 10 cents per 100 lb. minimum weight, 90 per cent of the marked capacity of cars, except when loaded to full visible capacity actual weight shall govern.

2051-A. Stone (broken, crushed or ground), C. L., from New Ulm, Minn., to Manning, Ia.; present, 9½ cents per 100 lb.; proposed, 8½ cents per 100 lb., minimum weight, 90 per cent of marked capacity of car, but not less than 50,000 lb.

3190. Crushed Stone, C. L., from Mayville, Wis., to Davenport, Ia.; present, 17 cents per 100 lb., or Class E; proposed, 11 cents per 100 lb. Minimum weight 36,000 lb.

2556-B. Sand, C. L., from Bay City, Wis., to points below:

	Present, cents	Proposed, cents
Bettendorf, Ia. (Class E)	20½	08½
St. Louis, Mo.	12½	11½
East St. Louis, Ill.	12½	11½

Minimum weight 90 per cent of the marked capacity of car, except when loaded to full visible capacity, actual weight will govern.

Amendment No. 1 to Dkt. Adv. 3045. Cement (hydraulic, portland or natural), C. L., from Hannibal, Mo., to various points in Nebraska; present and proposed rates to a few points representative of the situation:

	Present, cents	Proposed, cents
C. & N. W. Stations.		
Blair, Neb.	18½	16
Irvington, Neb.	18½	16
Cedar Bluffs, Neb.	19	16
Davey, Neb.	19	16
C. B. & Q. Stations.		
Chalco, Neb.	18½	16
Ashland, Neb.	18½	16

Rock Loading at Lime-Plant Quarries

The Bureau Asks the Operators to Contribute Any Additional Information They May Have to Assist in Compiling a More Helpful Report

By Oliver Bowles
Mineral Technologist, U. S. Bureau of Mines

IN an endeavor to assist in the solution of lime-plant problems the United States Bureau of Mines is preparing a series of preliminary short papers dealing with particular problems in the industry. Already two reports have been issued, "Stripping Problems in Limestone Quarries of the Shenandoah Valley," Serial No. 2401, and "Use of the Well Drill at Lime-Plant Quarries," Serial No. 2424. (See ROCK PRODUCTS for March 24.) In compliance with the Bureau's request many operators have submitted valuable information on these subjects which will assist greatly in compiling a more complete and helpful report.

This paper is the third of the series. It is hoped that many operators will contribute additions to the information presented, as suggested in the final paragraph.

Importance of the Loading Process

Removing fragments of broken rock from the quarry floor and placing them in cars for transportation to the kilns is a very important quarry process. At most lime plants rock loading constitutes the largest single item of quarry cost. In view of the great expense involved in loading, a consideration of the relative merits of different methods followed, and the conditions under which each method may be most advantageously employed are worthy of more than ordinary attention.

Prevalence of Hand Loading

Hand loading of rock fragments is conducted at practically all small lime plants and many large ones. While the wide application of the method may be due partly to the reluctance of operators to depart from methods long in use, its employment by many progressive companies suggests inherent advantages that merit careful scrutiny.

Advantages of Hand Loading

An undoubted advantage to small operators with limited capital is the small outlay required for loading equipment. This consists of trackage, cars and ordinary hand tools such as pick, shovel, sledge and fork.

A second advantage is the opportunity it affords for selection of suitable material. Personal observation of every fragment permits the rejection of siliceous or otherwise impure masses. The hand loader is enabled also to reject all small-sized stone together with any clay or sand that may have been blasted down with the rock. Such undesirable materials are loaded on separate cars and removed either to a screening plant for recovery of the best stone or to the waste heap.

A third advantage of exceptional importance in the lime industry is the ability of the hand loader to maintain a minimum of fine materials. In modern lime burning in shaft kilns very little rock smaller than a 4-in. is acceptable, for it retards the draft. While all exceptionally large rock masses encountered in loading are blasted in block holes, masses of medium size or sledged to fragments not exceeding 10 or 12 in. across. The skillful sledger will break the rock into the desired sizes and produce only a very small amount of fine material. The mechanical breaker such as the jaw or gyratory crusher will subject the rock to much rougher treatment and thus produce more fines.

A fourth advantage in hand loading is the small delay to following operations that results from failure of loading equipment. Where loading is accomplished by one large machine, breakage of some essential part will cut off production entirely, while a steady flow of rock from a number of independent units insures more continuous operation.

Disadvantages of Hand Loading

The tonnage of rock handled per man employed is much lower when hand loading is followed than where mechanical equipment such as the steam shovel is employed. Therefore, a large gang of hand loaders is required to obtain the necessary output for a large lime plant. This is a decided advantage at times when labor is scarce or when wages are high.

In loading waste materials the advantage is more definitely on the side of the steam shovel. Where hand methods are employed, the loading of dirt and rock chips is slower than the loading of kiln stone. Commonly the contract price of loading dirt is 2 or 3 cents per ton higher than the price paid for loading good stone. The steam shovel, on the other hand, loads dirt with greater facility than it loads stone.

Restricted Use of Steam Shovel

Steam shovels are very widely used for rock loading at quarries, but in the production of stone for lime burning this type of loading equipment is used less extensively than in most other branches of the stone industry. The main reason for this condition is the necessity for sorting the stone according to both size and quality. As the steam shovel lacks the ability to thus select its materials, crushing and screening equipment must be added, and this involves so heavy a first cost that many operators prefer to use hand methods.

Size of Shovel

The extent of the operation should govern the size of the shovel. For an output of 150 to 300 tons of rock per day small tractor shovels with ¾ to 1¼ yd. dippers are suitable. Caterpillar tractors offer special facilities for rapid moving or for working on a soft bottom. For larger operations heavier shovels should be used. It is not economical to use either too small or too large a machine. Where the shovel is small in proportion to the size of following equipment, many blocks too large for the shovel to handle must be blasted even though sufficiently small to be readily crushed. This results in unnecessary blasting expense and waste of time. On the other hand, if a large shovel is used for a limited output the operating cost is excessive.

Advantages of Steam Shovel

Where hand loading is followed all rock masses must be broken at least to "one-man" size. The steam shovel, however, can handle rocks of several hundred pounds or even in excess of a ton in weight. If the primary blast breaks up the rock moderately well very little secondary blasting may be required, whereas in hand loading much secondary blasting, as well as a great deal of laborious hand sledging, are necessary.

For equal tonnage produced a much smaller gang of men is required with a steam shovel than for hand loading. Figures were compiled by the Bureau of Mines a few years ago for tonnage of rock per man loaded at cement-plant quarries. At 14 quarries where steam shovels were used an average daily output of 112 tons per man was obtained. In this estimate pit men and shovel men only were taken into account. For 11 quarries where hand loading was employed the daily tonnage per man, loaders only, was 16. This indicates that about seven times as much rock per man can be

loaded with steam shovels as can be done by hand. The possibility of greatly reducing the number of workers by substituting machines has an important bearing on many problems that confront the operator. In some instances the maintenance of a large output with a greatly reduced staff has for various reasons been quite distinct with the actual cost, constituted the deciding factor in the introduction of mechanical loading.

Disadvantages of Steam Shovel

The ability of the steam shovel to load rock of all sizes from chips to masses over a ton in weight is a great advantage insofar as the actual loading process is considered, but it necessitates additional work at later stages. For lime burning the rock must be in sizes approximately between 4 and 10 in., and thus it is necessary to have crushing and screening equipment when steam shovel loading is followed. Any operator therefore who plans to add a steam shovel to his quarry equipment, and who has no crushing plant, must face the additional expense for machinery to break and size the rock.

A further limitation of the mechanical loader is its inability to sort material according to quality. If flint, iron stain, or other undesirable impurities are scattered irregularly throughout the rock mass, the steam shovel loads them with the good rock. Lime manufactured from stone from which such impurities are not separated is of lower quality than that manufactured from hand-picked stone. A steam shovel operating in rock of fluctuating quality tends therefore to degrade the final product.

A steam shovel together with the necessary crushing and screening equipment requires a heavy investment which may not be justified for a small plant, though it may be a profitable investment for a larger operation. For small moderate-sized plants with limited capital it may be more economical to follow hand-loading methods.

Difficulty of Comparing Costs

In any attempt to compare the cost of steam shovel and hand loading consideration must not be confined to the mere loading processes. The secondary blasting cost is higher for hand loading than for shovel work. On the other hand, a steam shovel loads a mixed product from masses weighing tons to fine chips and dirt, while hand loaded rock is broken to size and separated from the fines. A hand sledge is a poor substitute for a rock crusher, and sizing of rock by hand picking is less efficient than mechanical screening, nevertheless they serve the purpose in a degree, and part at least of a crushing and screening cost must be added to the steam shovel loading cost in order to make a fair comparison between the methods.

The cost of hand loading is easy to determine for it is done almost entirely by contract. The contract price in eastern United States during 1922, varied from 18 to 23 cents per ton. To this must be added the expense for tools. The cost of steam shovel loading involves other and more complex factors. To the wages of shovel operators and pitmen must be added the necessary expense for fuel, oil, repairs, interest on investment and amortization (a proportion of the value set aside each year sufficient to replace the shovel with a new one when it becomes no longer serviceable).

As noted in comparing the cost with that of hand loading, part of the crushing and screening expense should be added to the cost of steam-shovel loading and a deduction made to compensate for the reduced blasting expense where the shovel is used. When the direct cost of steam-shovel loading is considered it may appear to be very much lower than the cost of hand loading, but when all factors are taken into account the difference is not so great. However, for open-pit work on a large scale it is probable that mechanical loading is considerably cheaper than hand loading.

A more definite report of costs could be prepared if operators would submit to the bureau itemized cost data of steam-shovel loading.

Factors Governing Steam-Shovel Efficiency

Small blasts on shallow benches are unsatisfactory for steam-shovel loading, for a succession of small supplies of rock involve great loss of time in moving the shovel and placing the tracks. Heavy blasts that throw down large volumes of stone are better suited for economical steam-shovel operation. Furthermore, the blast should not throw the rock down in a thin sheet, for this again not only necessitates frequent moves, but the shovel dipper is filled with difficulty when it works against a small resistance.

Adjustment of the charge to break the rock properly is of course a prime necessity. Insufficient shattering results in great loss of time in shifting masses of rock to one side for secondary blasting.

As the steam shovel lacks the ability to sort materials, a clean product cannot be produced if the overburden is only partly removed. The loading of mixed rock and soil is justified only where equipment for subsequent separation is provided. Screens may give a clean separation in dry weather, but a mixture of clay and rock is more difficult to handle in rainy seasons. If, through the presence of seams of clay-filled pockets, it is impossible to remove the overburden entirely, a washing equipment may assist greatly in promoting successful operation of the steam shovel.

The great advantage of the steam shovel is its ability to load many tons of rock per hour, but this advantage is largely nullified in many quarries through delays in waiting for cars. Tracks should be so arranged that empties may be placed and loaded cars removed with the smallest possible loss of time. There should also be an adequate supply of cars so that small delays at the crusher will not suspend loading through shortage of empties.

The efficiency of a steam shovel depends largely on the skill of the shovel runner. An experienced operator can load rock rapidly, and can use the dipper to move cars or to set aside large masses of rock for subsequent blasting. Care and good judgment are necessary qualifications. The ability to judge properly the size and dimensions of blocks are invaluable qualifications of a shovel runner, for the loading of over-sized fragments may greatly hamper operations through delay at the crusher. So prevalent are delays from this cause that a fixed rule is maintained at some quarries requiring all rock loaded to pass through the dipper.

Question for Which Answers Are Greatly Desired

1. Do you prefer hand loading in your quarry, and why?
2. Do you prefer steam-shovel loading in your quarry, and why?
3. What are your hand-loading costs per ton?
4. What are your steam-shovel loading costs per ton ?
5. What items are included in steam-shovel costs?
6. What information on loading could you supply in addition to that presented in this paper?

Increased Magnesite Production in 1922

THE production of crude magnesite in the United States in 1922 was 32 per cent greater than in 1921. It amounted to 63,487 short tons, valued at $650,742, according to James M. Hill, of the United States Geological Survey. Practically all this magnesite was obtained from California, though a little was mined in Washington during the latter part of the year, and some calcined magnesite was shipped from Valley, Wash. The largest California producer was the Western Magnesite Co., operating the Red Mountain mine, in Santa Clara county; the second, the Sierra Magnesite Co., near Porterville, Tulare county. The magnesite mines near Rutherford, Napa county, operated by C. S. Maltby, ranked third; and a small output was made from mines in Fresno, San Benito, Santa Clara, and Tulare counties.

No crude or calcined magnesite was exported in 1922. More than 90 per cent of the domestic was sold in the calcined form and brought from $30 to $50 a ton. The prices quoted on domestic were about $10 a ton throughout the year. The assurance of good prices upon the passage of the new tariff act stimulated the domestic industry. Many deposits in California are being reopened, and additional equipment is being installed at calcining plants. There is also renewed activity in the Stevens county field, Wash. All magnesite operators are optimistic as to the future of the industry.

Hints and Helps for Superintendents

Inexpensive Conveyor

ALL of the bagging machines in the Gager Lime and Mfg. Co.'s plant at Sherwood, Tenn., are on the ground floor, which is on a level with the car-loading platform. When cars are available the lime is trucked into them from the baggers; when there are no cars, it is trucked into the store room. But last year, during the slack season, the stock room was completely filled and it was necessary either to provide more storage space or to stop production.

On the second floor of the plant there was considerable space which could be used for storing, but how to elevate the sacked lime economically without purchasing special equipment was, at first, a problem. The ingenuity of W. R. Hoback, general superintendent, however, solved it, for the equipment he designed and installed cost practically nothing and serves the purpose most satisfactorily.

An old piece of 10-in. transmission belting and two 12-in. face, 10-in. diameter, wooden pulleys were used to make up a conveyor, mounted on 2x4-in. timbers, one pulley at each end of the frame, which was 20 ft. long. This improvised arrangement extended from the bagging machines to the second floor at an incline of approximately 40 deg.

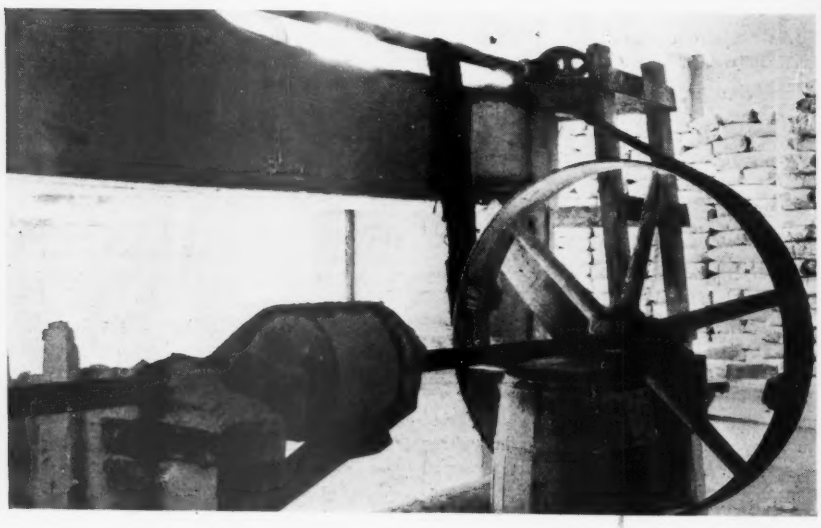
One of the two illustrations shows how the conveyor was driven. The upper-end pulley was mounted on a 2-in. shaft which runs parallel with and 2 ft. above the floor. On this same shaft was mounted a 48-in. split pulley; this was belt-connected directly to a 2-in. shaft from a motor driving another machine. Thus, the conveyor was powered so that it moved at the desired slow speed.

This home-made conveyor elevates the sacked lime to the second floor to be stored. When not in use the lower end is raised out of the way by block and tackle

Spaced every 6 ft. on the belt were small wooden blocks to keep the sacks from sliding. As the bags were filled it was only necessary for the operator to remove them, turn around and place them on the belt—without leaving the machine. On the second floor two men with trucks worked alternately in removing the bags and trucking them to storage. When it isn't necessary to store on the second floor, the driving belt is removed and the lower end is raised out of the way by a block and tackle.

Suspended Baffle Plates

CLEANLINESS is one thing that officials of the Louisville Cement Co., Speed, Ind., insist upon having in and around the two plants. Herewith is illustrated one of the ways they do it. The cars shown are loaded from steel-lined chutes from bins above and the stone comes down with considerable force. Before the baffle plates were suspended, the stone would hit the edge of the car and bound to the ground, giving an untidy appearance. The suspended plates were hung so that they would stop the bulk of the falling stone and divert it into the cars. By careful observa-



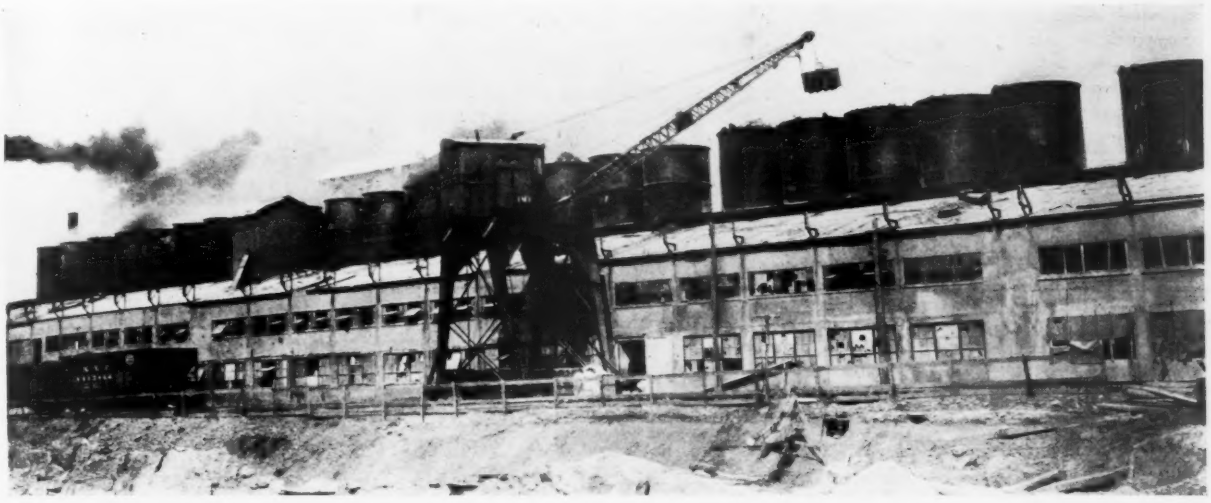
The conveyor's head pulley is mounted on a shaft having a 48-in. driving pulley direct-connected by belt to a 2-in. shaft

Suspended plates keep the stone from bounding over the sides of the cars

tion a slight upward bend in the lip of the chute at the left may be seen. This tends to check the force of the flow.

Traveling Gantry Crane for Lime-Kiln Feed

THE illustration shows one of the most modern installations for feeding a battery of lime kilns from an adjacent quarry. The device used is new to the lime and quarry industry, but a long-used and valuable aid for handling cargoes on wharves —namely, a traveling gantry crane.



Traveling gantry crane for feeding a battery of lime kilns at the plant of the U. S. Gypsum Co., Genoa, Ohio

In this case the battery of kilns parallels the edge of the quarry pit. Formerly, stone was raised from the quarry in the usual way by a cable-operated incline. Now, the cars are transferred from the working face across the quarry to any point at the foot of the ledge along which the crane operates. The cars hold between two and three tons each and have removable bodies.

The crane operator, riding in his house on top of the crane, can spot his crane opposite the end of any track and, with the help of one man in the quarry to fasten and unfasten the lifting lines, can dump a carload in any one of several kilns within reach, without moving the crane. The dumping is done, as the illustration shows, by the cranesman.

The speed and efficiency of this device are obvious from a little study of conditions. This battery of kilns consists of 24 shaft kilns, each requiring from 40 to 50 tons of stone per 24-hr. day—about 1000 tons per day, it is said.

The installation shown is that at the Genoa (Ohio) lime plant of the United States Gypsum Co.

"Safety First" Reminders

NO operation in the rock products industries is truly modern unless those in charge are advocates of "Safety First." Practically all of the larger companies have elaborate systems of promoting the work and spare no expense in educating their employes how to look out for their own welfare as well as that of their fellows.

Enough cannot be said of the necessity for providing guards on dangerous machinery, railways on platforms and walkways and warning signals and signs at all points of danger. These things are done at practically all operations, but as a rule such precautions against human injuries are specific. That is, there is only a signal or sign —a reminder of danger—at places where danger is *known* to exist—for instance, a "Danger, High Voltage" sign on a switchboard. Employes working at an operation where everything known to be dangerous is so labeled get careless and are cautious only while they are in the immediate vicinity of a *known* danger point. They forget that it is possible to meet with an accident while walking across a floor by stumbling and falling, resulting in a broken arm or leg. While unlikely, yet such an accident is possible. There was no warning sign to tell the man there was a small obstruction in his path. But there should be signs of all kinds about a plant to serve as steady reminders to the men to be on the continual lookout for their own safety.

The sign shown in the illustration, "Don't be a jay worker or a safety shirker," is one of many about the Dixie Portland Cement Co.'s plant at Richard City, Tenn. It does not convey a definite warning to a passer-by of an immediate danger. That fact is evident by its location—near a harmless pile of brick. But it does serve its purpose in reminding every passing workman that he is a *shirker* if he is not a promoter of "Safety First."

Signs like this are designed not to warn of a specific danger but merely to serve as continual reminders of the necessity for "Safety First"

Quarried from Life

By Liman Sandrock

Miss Sargent of the Warner

YOU mightn't think it, but when we scanned our favorite book of quotations for a poetic inspiration to begin this scant biography, we were positively startled to find that some of the greatest minds of the well-known Past have been mighty vicious in expressing their views on the Fair Sex!

Old George W. Aristophanes was downright ornery; John J. Juvenal was satirical; later, Papa Dumas made Fouche give expression to his "Cherchez la femme;" Alexander Pope displayed a sour mind; even the Bard of Avon just gets by with what Rosalind said: "I thank God I am not a woman to be touched with so many giddy offences as He hath generally taxed their whole sex withal." And it is but scant consolation to learn that George Eliot administered a whale of a wallop to us of the sterner sex by saying: "I'm not denyin' the women are foolish; God Almighty made 'em to match the men." And there you are. We're off the poets for life!

But you know that our industry today has many notable examples of fine, successful women in our midst—like Miss Mary Squire, Doctor Carpenter, Mrs. Evans (and the Lord forgive us for unintentionally omitting the others!). On this particular occasion we desire to say something pleasant anent Miss Sargent of the Charles Warner organization.

In ROCK PRODUCTS for May 19 we made the modest announcement that "Miss Claudia M. Sargent has been made New York district manager for the Charles Warner Co.", with a few more coldly informing words stating that "Miss Sargent is probably the only district manager of her sex in the lime industry."

At the same time this "personal" furnished us a "lead" in our capacity as veracious historian. So we wrote to Editor Dinsmore of the *Warner-American News* asking that he use his good offices in inducing Miss Sargent to become the headliner for this page. Indubitably, Brother Dinsmore did his very best, and we are correspondingly grateful—BUT! what we say here goes to prove that Miss Sargent is reluctant to broadcast her achievements or to do justice to her unique position in the lime industry. However—

Like many of us, she was born in a small town—New Berlin, N. Y., to be exact. We can only surmise that she passed successfully through the infantile stages of whooping-cough and the measles; that she wore her hair in pigtails at the time bashful swains were fighting to carry her schoolbooks; that her bright nickel went steadily past the village drugstore to the Sunday-school without depreciation; that soon those pigtails were proudly coiled on her sedate young head; that after high school and college, and—oh, well, what's the use of a mere man trying to figure out these things if he has no help from the heroine herself?

Came the time, as the fiction writers put it, when Miss Sargent made up her mind

Miss Claudia M. Sargent, New York district manager for the Charles Warner Co.

to labor in New York City—that Mecca of most of us up-staters. Here she picked out, of all things, plaster as a field for labor. Wisdom? Surely! we are talking about a wise young lady. The house was the Clifford L. Miller Co. They not only made plaster, but they distributed it wholesale and retail in the metropolitan and adjacent districts. Miss Sargent was cradled in lime at the very outset, as it were.

And while she tells us that "I had the opportunity to familiarize myself with the operation of all departments," she does not say how hard she studied to make herself competent; what were her difficulties—or her successes. Of course, we can read between the lines.

Then comes another hiatus, and we find her invited by Mr. McDonald, former manager of the Charles Warner organization, to join the Warner forces when the New York office was opened—and there she is today, manager herself!

We'll wager a cookie that Miss Sargent would disclaim any special merit for having achieved this success, and that she would say almost any other lady, given the same study, inspired with the same ambition, and cultivating the identical vision and keenness, would in time be just as good a "lime man" as she is.

Good luck go with you, Miss Sargent!

They Said It

VOLSTEAD ANTHOLOGY

When the raisin mash is brewing,
And the worm is in the still,
There's a pile of gravel waiting
In the graveyard on the hill.

SALES MANAGER FIRMAN SMITH, of the American Limestone Co., is advising every farmer to sow all the summer legumes possible. "Make the man who doesn't do this as conspicuous in his vicinity as he who now raises 'bumblebee cotton'." As ignorant of this particular bee's habits, we'll bite. Who's stung—Us?

SOME DAY, America is going back to the Stone Age, for rock and cement will be the building materials, says the Chicago *Tribune*. There's lots of things we could go to the stone age for besides caveman stuff.

REMEMBER Parley P. Christensen, the Farmer-Labor presidential candidate in 1920? Well, Parley P. has been studying agrarian conditions abroad for the past two years. He says Denmark land is producing well after 13 centuries of plowing, and that China's land is as fertile as it was 4000 years ago—and we have many's the abandoned and played-out farm in this country. Fertilize, brothers, fertilize! is his cry.

THE GERMANS are making portable safes of concrete without iron or steel outside casings. Question: If 55,000 marks equal one perfectly good Uncle Sam dollar, how many dollars' worth of marks can be crowded into a portable concrete safe?

FIGURES from the American Railway Association show that during the week ending May 12, 46,242 cars of sand, gravel and crushed stone were moved by the railroads. This record beats the one of July, 1922, when 45,639 cars were moved. And at that, the cars moved represented only 88 per cent of the requirements.

F. L. SCHOTT, manager of Bartels Brewing Co., will enter the building materials field—and brew without the froth.

Editorial Comment

The End of "Open Price"

A decision of the United States Supreme Court on June 4, in the linseed crusher association case, reversed the decision of the District Court at Chicago (see ROCK PRODUCTS, November 19, 1921, page 26) and evidently puts an end to all "open-price" associations. The defendants in this case were a number of linseed cake and meal manufacturers who paid dues to a separate organization, known as the Armstrong Bureau of Related Industries, whose function was to compile and disseminate certain statistical matter relating to prices, production, etc. This bureau was supposed to have been organized strictly within the Sherman anti-trust law, and was held to be a legitimate method of exchanging business information by District Judge Carpenter when the case was tried in Chicago November 1, 1921.

However, in line with its decision in the Hardwood Lumber Manufacturers' Association case, the Supreme Court finds the exchange of such information by competitors a violation of the federal laws.

"The obvious policy," said Justice McReynolds, "indeed, the declared purpose of the arrangement was to submerge the competition theretofore existing among the subscribers, and to substitute 'intelligent competition,' or 'open competition,' to eliminate 'unintelligent selfishness' and establish '100 per cent confidence' to the end that the members might 'stand out from the crowd as substantial co-workers under modern co-operative business methods.'"

These are phrases familiar to every member of every trade association. The court held that the absence of a purpose to monopolize was not necessary if the results were such as to furnish evidence that the natural competition was restrained.

It is obvious from this and other recent decisions that there is no legitimate way for a trade association to collect or disseminate any price information whatsoever; or any production data which can be used to determine prices. Again let us point out that the method of collecting and disseminating price information as *news* of the industry, as practiced by ROCK PRODUCTS, *Iron Age* and other trade journals, is the only legitimate way in which such information can be exchanged among competitive producers. Every effort is made to keep ROCK PRODUCTS' prices accurate and up-to-date and the co-operation of every reader to that end is earnestly solicited.

Beneficent Combinations

The principals in the case of the State of New York vs. the Buffalo Gravel Corporation have been found *not guilty* of creating a monopoly in the production and sale of sand and gravel by a verdict rendered by a Supreme Court jury at Buffalo, N. Y., June 6. The details of this organization—the Buffalo Gravel Corporation—were published in ROCK PRODUCTS June 7, 1919, page 40. In substance it is a distributing organization composed of and owned by several of the principal sand and gravel producers of the city. Each producer maintains his own individual producing company and organization, but sells his entire output to the distributing corporation at a fixed price. The distributing organization resells the material, together with its delivery service.

The scheme is such that an efficient producer may profit in the production of his material in proportion to the efficiency or advantageous conditions of his operation. In other words, there is still every incentive to efficiency in production, for the margin between the fixed price at which the material is purchased by the distributing company and the production cost of the material depends on the efficiency of each producing plant.

The distributing organization, by combining the facilities of several former competitors, systematizing delivery work, eliminating duplicate sales efforts, etc., was able to effect large economies in the distributing and sales costs; and was thus enabled to make, in all probability, a very good margin of profit. Yet the records show that prices were not increased, and were actually maintained at a level as low or lower than the prices of similar material elsewhere.

The organization came in for an investigation by the Lockwood Committee of the New York State Legislature and later indictments were found against its organizers. Now, fortunately for business efficiency, the highest court in the state has decided that all combinations designed to systematize and economize production and distribution are not necessarily harmful combinations.

Questions and Answers

Edmund Shaw, Consulting Engineer, Chicago, Ill., Expert on Problems of Screening, Washing and Hydraulic Separation

THE TECHNICAL STAFF OF ROCK PRODUCTS

Edwin Brooker, Washington, D. C., Consulting Expert on Matters of Transportation and Freight Rates

Gordon Smith, First National Bank Bldg., Chicago, Ill., Expert on Crushing and Cement-Plant Problems

No. 61. **Facts About Filtering Sand.**—Please tell me what is the prevailing price on filtering sand; in what part of this country is it mostly produced, and what is the standard mesh test for this sand?—J. G. E.

A. The price for filter sand is ordinarily about the price of commercial sand and gravel as given in our Market Prices. It varies, however, in different parts of the United States, according to the freight rates and the specifications which have to be met and the abundance or scarcity of the material. A great deal of it is sold around $3 a ton. The specifications for filter sand of one of the largest manufacturers of filters call for everything between 12-mesh and 80-mesh; the important thing to the sand is that the mean effective size and the uniformity coefficient should conform to their requirements. We have published in the past a number of articles (see issues of June 7, 1919, page 35; November 8, 1919, page 30, and recently in this department, January 27, 1923) which explain the mean effective size and uniformity coefficient. We refer you to these, and further suggest that you write to some of the manufacturers of sand filters for their specifications and also to the American Waterworks Association, 153 West Seventy-first street, New York City. Almost any sand high in silica will serve as filter sand. A great deal of this sand is manufactured in New Jersey and sent to various parts of the country. A lot more, however, is made locally by sand plants near the place of use.—E. S.

No. 62. **Magnesite, Where Found, and Its Uses.**—Will you please give me some information on magnesite, its uses, and where found?—H. B. S.

A. Magnesite is a natural carbonate of magnesium, and when pure contains 52.4 per cent CO_2 (carbon dioxide) and 47.6 per cent MgO (magnesia). It has a hardness of 3.5 to 4.5, and specific gravity of 3 to 3.12. It is both harder and heavier than calcite (calcium carbonate), and also contains a higher percentage of CO_2, as calcite has but 44 per cent. Magnesite is found along the Coast Range in California from Mendocina county to a point south of Los Angeles, and along the western slope of the Sierra Nevada from Placer county to Kern county. Most of the California magnesite is comparatively pure, and is ordinarily a beautiful, white, fine-grained rock with a conchoidal fracture, which resembles a break in a piece of porcelain. It is also found in Washington. These deposits, however, are associated with extensive strata of dolomitic limestone, for the product closely resembles dolomite and some crystalline limestones in physical appearance. It appears to contain more iron than that found in California, which makes it desirable for the steel operators. The principal uses of magnesite are: Refractory linings for basic open-hearth furnaces, copper reverberatories and converters, bullion and metallurgical furnaces; in the manufacture of paper from wood pulp; and in structural work; for exterior stucco, flooring, wainscoting, tiling and sanitary installations of all kinds. In connection with building work it has proven particularly efficient as a flooring for steel railroad coaches, having greater elasticity and resilience than portland cement. When used for refractory purposes the magnesite is "dead burned." That is, all, or practically all, of the CO_2 is expelled from it. For cement purposes it is left caustic—i.e., from 2 to 10 per cent of the CO_2 is retained. When dry caustic magnesite is mixed with a solution of magnesium chloride in proper proportions, a very strong cement is produced, known as Sorel cement. It is applied in a plastic form, which sets in a few hours as a tough, seamless surface. It has also a very strong bonding power, and will hold firmly to wood, metal, or concrete as a base. It may be finished with a very smooth, even surface, which will take a good wax or oil polish. As ordinarily mixed there is added a certain proportion of wood, flour, cork, asbestos, or other filler, thereby adding to the elastic properties of the finished product. Its surface is described as warm and quiet as a result of the elastic and nonconducting character of the composite material. The cement is frequently colored by the addition of some mineral pigment to the materials before mixing as cement. There is no doubt that the material is steadily coming into more general recognition and favor for these uses. For a few special uses it is more or less disqualified; as an instance, it is not suited for construction of swimming tanks or for conditions of permanent wetness, since under constant immersion it gradually softens, although it is said to withstand intermittent wetting and drying and is recommended for shower baths. Naturally it is not acid-proof and not wholly alkali-proof, which might be a disadvantage in use for laboratory floors and tables; but these are rather special requirements. Its cost per square foot is given (in 1913) as 25 to 33 cents, depending on area, which is estimated to be lower than marble, cork, rubber, clay or mosaic tile, slate or terrazzo, although more expensive than wood, asphalt, linoleum or portland cement.—L. L. R.

No. 63. **Crushed Stone Size Numbers.**—Most all contractors have numbers for each size of stone. Please advise what numbers apply to each size, from dust up to and including 4 in.—R. E. L.

A. There is no standard set of numbers for the various combinations of sizes of crushed stone, because of the difference in specifications throughout the country. As long as there is a difference in specifications, it will be impossible to establish a standard set of numbers.

Rock Products' editors have found that even in the same counties no standard set of numbers is adhered to. At one plant, No. 1 stone may mean 2- to 4-in. material, and at a plant not 10 miles away, 1½x3-in. stone may be called No. 1. It is common practice, however, where sizes are numbered, to classify the largest size as No. 1, the second largest as No. 2, the small size as No. 3, and screenings as No. 4.—G. M. E.

No. 64. **How to Determine the Capacity of Storage Space for Coarse Sand and Gravel.**—What is the rule by which I may determine the capacity of storage space for coarse sand and gravel?—A. J. W.

A. The weight per cubic yard of sand and gravel varies somewhat with the amount of moisture contained. For fairly dry material the weight per cubic yard is:

	Pounds to cu. yd.
Bank sand	2500
Torpedo sand	3000
Crushed stone	2500
Screenings	2500
Gravel	3000
Roofing gravel	3000

—N. C. R.

No. 65. **What Is Chalkstone, Cliffstone or Calcium Carbonate?**—In Rock Products I find no market quotations on chalkstone, cliffstone or calcium carbonate. Does this product come under ores and mining?—C. N.

A. We are quoting prices in Rock Products of agricultural limestone, some of it 70 per cent through 200 mesh. This material is identical with chalkstone, cliffstone or calcium carbonate. These are merely names for pulverized limestone or whiting. It is also produced as a precipitated calcium carbonate in some chemical processes, but almost any material ranging from 70 to 90 per cent through a 200-mesh screen would come under this classification.—N. C. R.

New Machinery and Equipment

A New Portable Centrifugal Pump

THE Pennsylvania Pump and Compressor Co. of Easton, Pa., claims for its new portable, single-stage, centrifugal pump three important features: It combines capacity, compactness, and ruggedness.

The capacities of this pump vary from 350 gal. per minute at a 20-ft. head to 50 gal. per minute at a 35-ft. head. The suction opening is 4-in.; the discharge, 3-in.

Several parts have been eliminated, thus making the pump more rugged and compact, it is claimed. In the pump itself there are only eight parts—casing, head, impeller, base, shaft nut, shaft sleeve, water-seal cage and gland. The casing is designed to swing on its bolts so as to give the discharge only one of eight positions.

The engine is direct-connected to the impeller, which is of the single-section open type and is constructed of special bronze. This engine is manufactured by the New-Way Motor Co. of Lansing, Mich. It is said to be of the latest air-cooled type and embodies the Bosch magneto and impulse starter.

According to the description of this pump, it is applicable for cleaning out sumps in quarries; for bringing wash water to sand plants, and other similar purposes.

Discharge side of pump. Has capacity of 350 g.p.m. at 20-ft. head. Weight 780 lb. complete

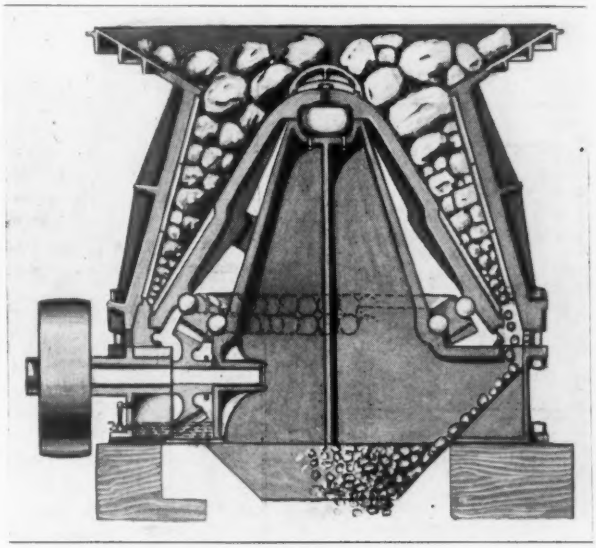
Suction side of pump, with hose. Has a 4-in. suction and a 3-in. discharge

A New Gyratory Crusher

PATENTS are pending covering a new gyratory crusher to be placed on the market by the Lazier Gas Engine Co., Buffalo, N. Y., which it is claimed will be of unusually simple construction.

The crushing cone is suspended from the top of a stationary central pillar and is given gyratory motion by means of a series of balls running in the outer and eccentric race of a large horizontal gear wheel which is driven by a pinion on a short pulley shaft.

The outstanding features claimed for the Lazier crusher are an open top, preventing bridging; less than half the weight and with little or no friction; the increased area gives greater capacity, and the fulcrum arrangement breaks up the large stone with less power; it is readily adjustable to crush various sizes; the mantle and stone weight is carried by the central internal support and not by the ball races; should the pinion become worn it can be replaced without dismantling the machine; any degree of gyration can be had by replacing the ring gear of any desired eccentricity, and practically no machine work except the drive shaft.



A stone crusher in which the mantle does not revolve. It has an unobstructed feed opening

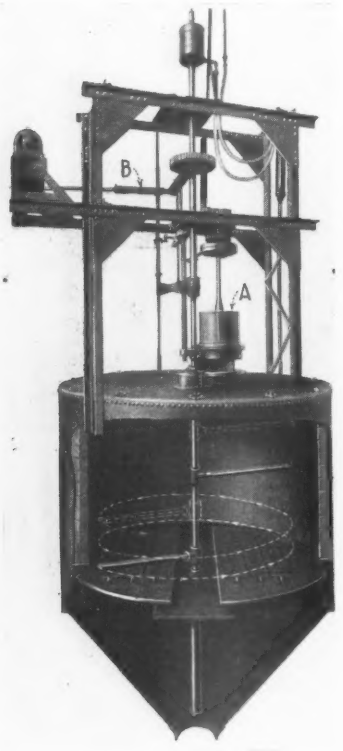
Full Automatic Gas Producer

THE Gas Producer and Engineering Corp., New York City, has recently brought out several improvements in its gas machine. The company says that the agitating device consists of water-cooled horizontal arms which stir up the bed without causing verticle channels. It is

also claimed that this method keeps the CO_2 content at a very low minimum by preventing the oxygen from reaching the top of the bed. If this takes place, the CO is burned to CO_2.

The other main improvement claimed is that even the raw gas as it comes from the producer is remarkably clean as the undisturbed top layers of coal act as a filter; furthermore, the gas is very uniform in quality.

The feeding device is said to be unique



This gas producer has a uniform fuel feed and escape of gas is said to be impossible

in that it automatically distributes the coal in the most efficient way for any depth of bed. The actual feeding is accomplished by allowing the coal to drop from the hopper on a revolving plate. This plate, with a round hole in it, is superimposed upon a second plate similarly constructed. The coal falls on the top plate, and when the two holes coincide a measured amount of fuel is fed to the main chamber. A device for preventing the escape of gas operates in synchronism with the feeding mechanism. While all moving parts are automatic, they are said to be in easy reach and under immediate control of the workman. The speed of operation may be varied over a considerable range.

To provide for any severe and unexpected strains on the driving mechanism a spring has been placed on the ratchet arm, taking up the shocks and promoting flexibility. Producers with this improved apparatus have been installed in the steel, glass and other metallurgical industries. The sizes range from 6½ to 10½ ft. internal diameter. The power requirements are small, being cared for by motors ranging from 2 to 3 hp., depending upon the size of the machine.

Improvement of Centrifugal Pump

THE Evinrude Motor Co., Milwaukee, Wis., announces a recent improvement in the bearing equipment of its centrifugal pump, in use by contractors, engineers, dredging companies, etc.

To support the pump shaft at the lower end, a ball thrust bearing has been provided. This bearing supplants the lignum-vitæ plug heretofore used. After a six months' test the company claims that the ball-bearing greatly increases the life of the lower bearings and also makes the pump operate more freely and effectively.

This improvement is said to be of special value because it can be installed in those pumps now in the hands of users.

New Dipper Tooth for Steam Shovels

A NEW type of replaceable dipper tooth has been invented and perfected by the Taylor-Wharton Iron and Steel Co., of High Bridge, N. J. The tooth is known as the Van-Port reversible dipper tooth. It is made symmetrical with reference to the socket which receives the center web of the tooth. The sides of the tooth are beveled inward and seat upon bevels in the socket. An inner rib fits into half ovals in the socket. A bolt with a tapered head of oval section holds the tooth in place, the bolt hole in the web of the tooth being made oval to allow a slight adjustment. Nothing protrudes at the crown or at the sides of the tooth. The bolt locks in place. Both the base and tooth are made of manganese steel. L. W. Van Buskirk and Philip Porter, both of the Taylor-Wharton Iron and Steel Co., designed the tooth.

Reversible dipper tooth

Compound for Insulating Purposes

ON a recent installation in a rotary kiln, announces the Schaffer-Alles Chemical Co., Pittsburgh, Pa., wherein its insulating material was used as a lining between the firebrick lining and the steel shell, it was found that this compound so prevented radiation that when a temperature of 2000 deg. was maintained in the kiln, at the hottest point on the shell it was possible to place the bare hand without burning.

This lining is applied 2 in. thick between the firebrick lining and the steel shell in the form of a plaster, and it is claimed that it hardens sufficiently to carry the weight of the lining and maintain its form when the firebrick lining is removed.

This new insulating compound is said to make a level, smooth surface in the kiln for placing the firebrick lining, and eliminates a great deal of extra labor and expense in fitting the firebrick lining in the kiln; also, there is an even surface on which the brick lining can be placed more securely.

Cutting the radiation to the point that this insulating material does, the company contends that it effects a great saving in fuel and eliminates other bad features of rapid radiation of the heat through the steel shell of a rotary kiln or a shaft kiln. The first experiments on this compound have been in operation for quite a period. An improved installation was made at the plant of the American Lime & Stone Co., Bellefonte, Pa., and high results were obtained there, says Mr. Alles.

Lime Pays with Clover

"IT would pay any farmer who is interested in soil development and soil building to visit a demonstration being conducted by Julian Sellars on his farm near Mebane, where he shows the value of limestone in growing clover," says W. Kerr Scott, county agent of Alamance county, North Carolina.

Mr. Sellars planted a 15-acre field to wheat and clover last year, liming half of the area and leaving the other half unlimed. Mr. Scott states that the lime was applied with a wheat drill, going over the ground twice. About one ton was used to each acre, applied on top of the ground.

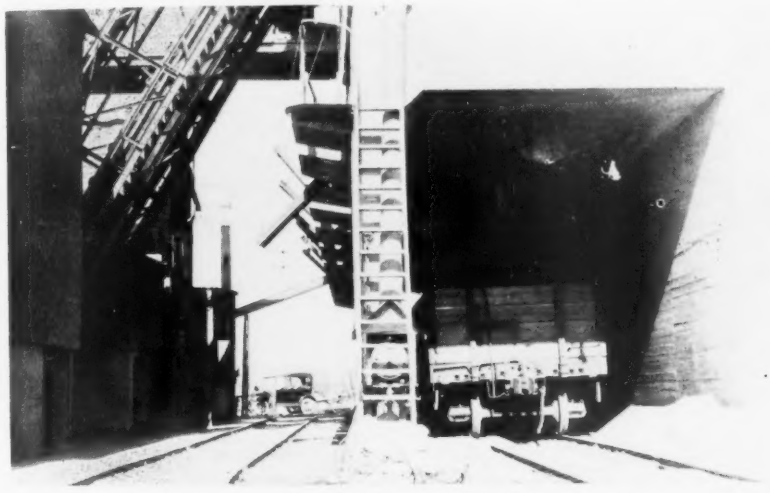
On a recent visit to this demonstration, Mr. Scott found that the clover on the limed half of the field was up to a fair stand, was dark green in color and showed a healthy growth. Now the clover is about 6 in. high.

On the unlimed half of the field, there are a few scattered, pale yellow bunches of clover all very unhealthy-looking. This clover is only about 3 in. high and there are more weeds than clover; very few weeds are to be found in the limed part. Mr. Scott says that the entire field received the same treatment in every way except that half was limed and half unlimed.

The South's Biggest Sand and Gravel Plant

The Dixie Sand and Gravel Co.'s Plant at Chattanooga, Is One of the Finest and Most Elaborate Plants in America. Its All-Steel and Concrete Construction Speaks for Permanence and Endurance and Insures a Day-in-and-Day-Out Production of 1500 Tons

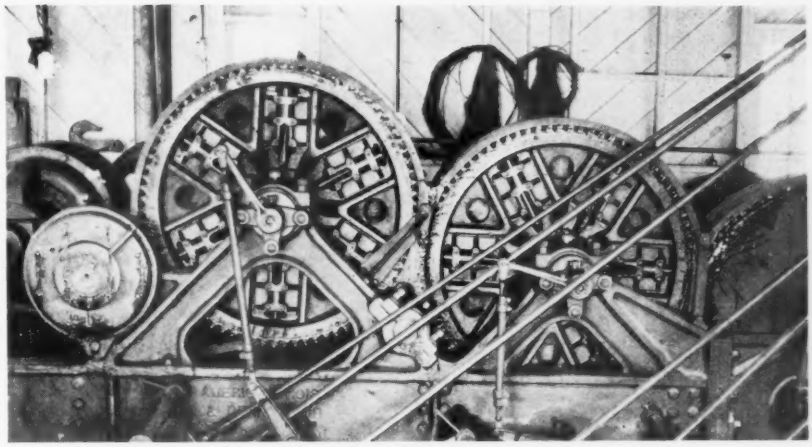
THE Dixie Sand and Gravel Co., a subsidiary of the Dixie Portland Cement Co., Richard City, Tenn., operates probably the biggest, most modern and complete sand and gravel plant in the South and one which is said to have cost more than $450,000. The plant, which is on the banks of the Tennessee river and within the city of Chattanooga, was built early in 1922 and has just recently completed its first successful operating year.



A track runs between the crusher and screen buildings and cars are loaded from the side and center

It was not an exception to the usual rule that new plants have to be changed from time to time to make them entirely satisfactory; but the necessary changes were trivial and were made within a few weeks after the plant first started. Since that time it has operated continuously with only such interruptions as were brought about by unusual river conditions.

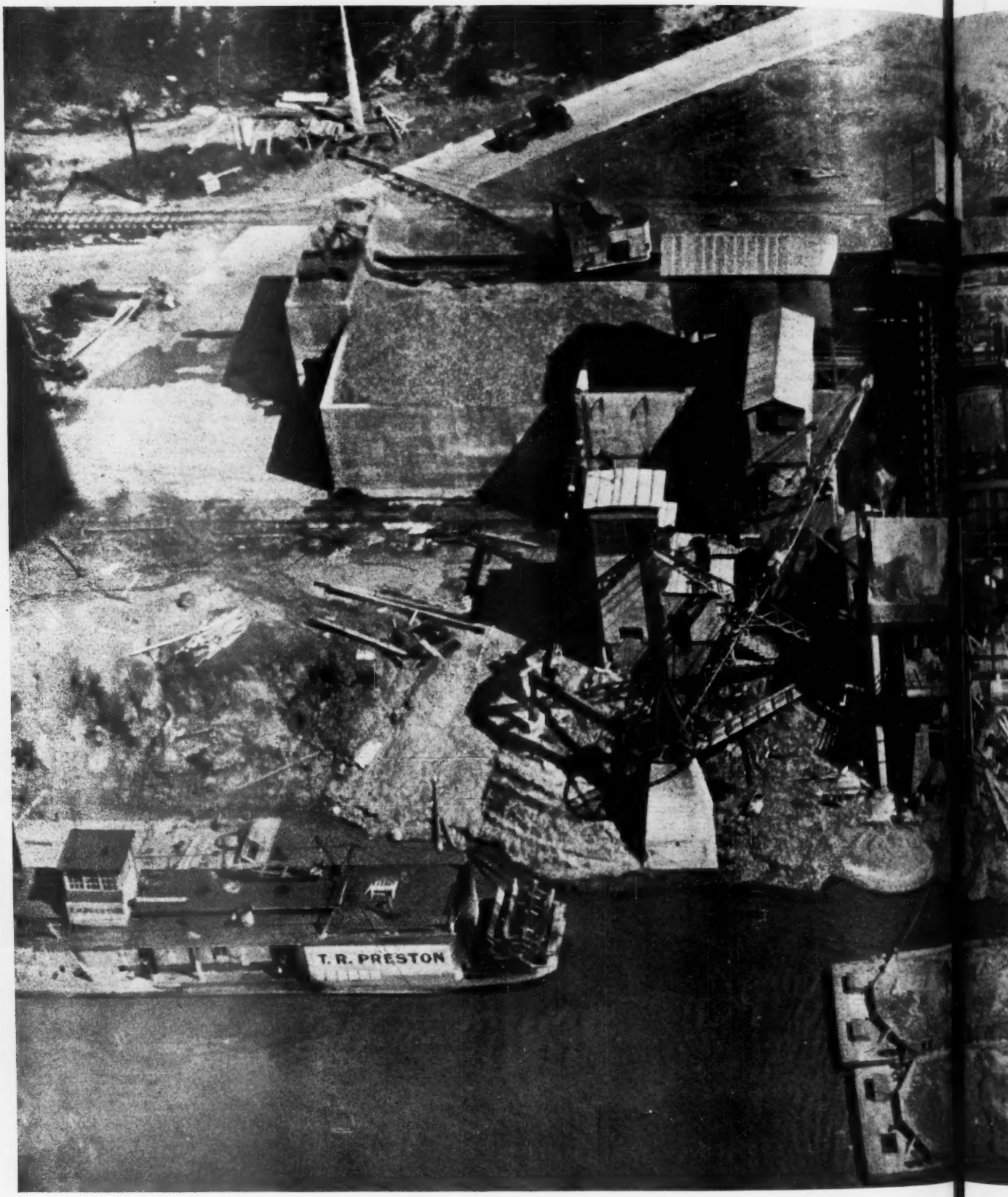
The designing of the plant was done by W. M. Klein, general superintendent of the cement plant. Mr. Klein was instructed to design a plant that would stand indefinitely, endure anything and produce 1200 to 1500 tons of washed and graded sand and gravel per 10-hr. day. That is just the kind of plant he *did* design and it was put up accordingly to the most minute detail. The construction was supervised by H. B. Springer, who is now associated with the company in the capacity of sales and traffic manager. Mr. Springer's experience and knowledge, gained while with the Portland Cement Association were invaluable to him in constructing the plant and the concrete work done is an example of what was in the mind of the man who originated the slogan, "Concrete for Permanence."



This 150-hp. hoist is operated from a loft mounted above and in front of it. Note the extended levers

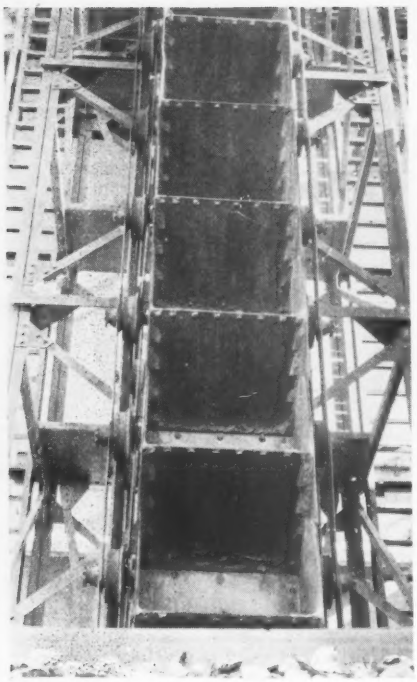
The outstanding feature of the plant is its unloading arrangement. This equipment comprises an American Hoist and Derrick Co. stiffleg latticed-steel derrick having a 33-ft. mast, a 65-ft. boom and 14-ft. bull-wheel, mounted on a massive concrete foundation at the water's edge. The derrick is controlled from a glass-sided house which is midway of the plant proper and the derrick. Within this glass loft is housed a three-drum 150-hp. American electric hoist which operates the derrick. Swinging of the derrick is effected by a single-drum American hoist powered by a 30-hp. motor. The operator's stand is directly over the hoists, which are operated by extended levers.

The unloading derrick empties into a concrete hopper, approximately 30 ft. above the ground level, which is 16 ft. square. This hopper is provided with a drop-bar grizzly of 3-in. spacing. Directly under the hopper is a No. 16 McCully gyratory crusher, driven by a 100-hp. motor, to which is chuted the rejections from the grizzly. Material passing through the bars is received in a small-capacity bin which also takes care of the discharge of the No. 16 crusher. From this bin it is automatically fed to a 30-in. belt conveyor of 35-ft. centers leading to and discharging into a 30-in. Worthington pan conveyor of 65-ft. centers which is equipped with 6½-cu. ft. capacity buckets.



This aeroplane view of the Dixie Sand and Gravel Co.'s operation at Chattanooga, Tenn., was taken shortly after the plant was l ich accou

lant was b ich accounts for the scrap lumber, concrete forms, and rubbish in the foreground. Note the marine railways at the extreme right



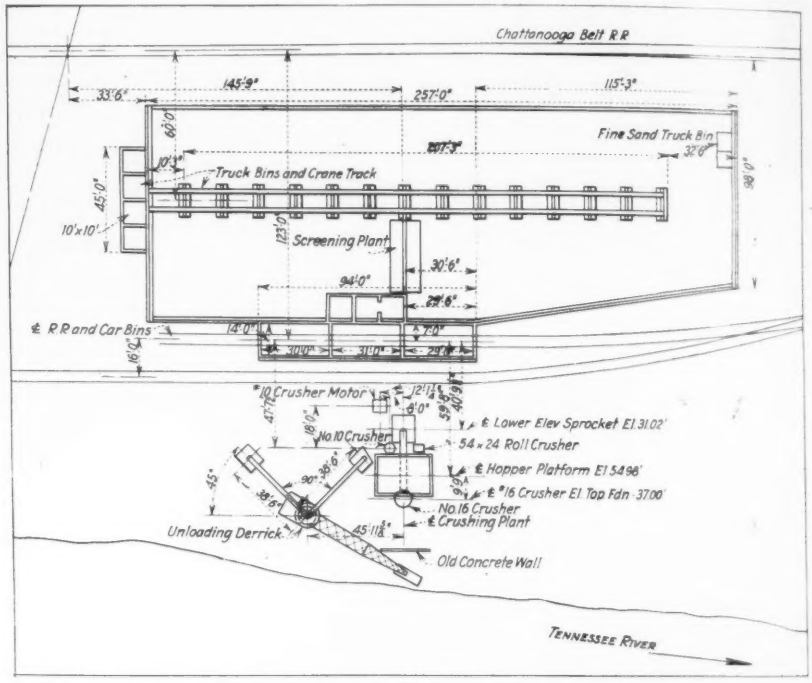
The buckets are 30 in. wide, having a capacity of 6½ cu. ft. each

Screening is done by a 60-in. Worthington revolving screen, 20 ft. long, made up of three sections, perforated ⅜ in., 1¼ in. and 2½ in. Here the material is washed as it is screened by water from a 3-in. perforated line extending through the screen. The screen is driven by a 25-hp. motor. Rejections from the rotary screen are chuted to a steel bin from which it is conveyed by a 24-in. by 35-ft. conveyor to the secondary crusher—a 54x24 Superior roll. As an auxiliary secondary breaker, there is installed directly under the steel bin a 10-in. gyratory crusher which can be fed by simply opening a gate in the small steel bin. This unit originally served as the only secondary breaker, but was found to be too small for the requirements. Steel chutes are arranged so that both crushers discharge into the main pan-conveyor.

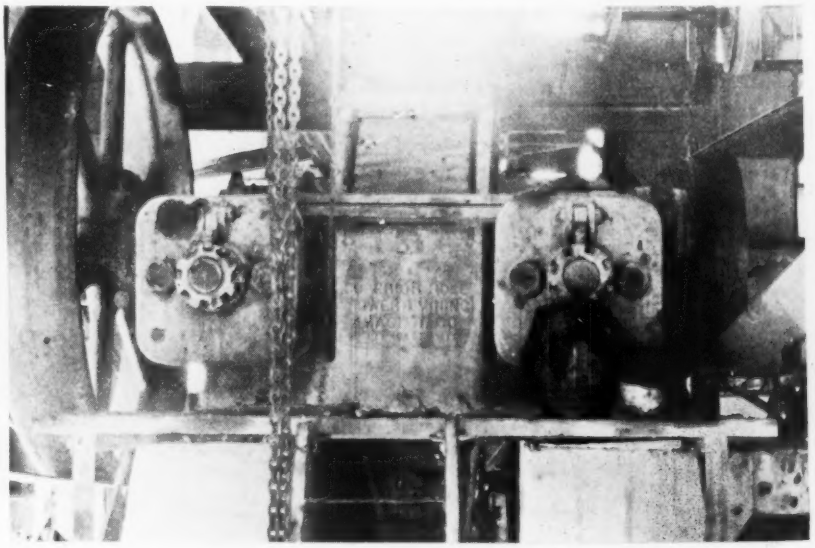
The products of the 1¼ and 2½-in. sections are chuted into individual bins while that passing through the ¼-in. section is flumed to a Hummer screen. The product of this screen is a uniformly sized roofing gravel. From this screen the sand and water pass to two Stephens-Adamson settling tanks, from which is drawn the coarse, or concrete, sand. The overflow from the settling tanks is flumed directly into four small settling cones which catch the fines that would otherwise be wasted. These cones are of the company's own design and were manufactured locally. Their product is an excellent grade of plaster and traction sand.

Underneath the screens are seven concrete bins, each of 200-yd. capacity. These are used exclusively for car loading; one track runs directly under them while another runs on the outside for side loading. On the opposite side of the bins is an open storage which is divided by concrete walls.

As the bins fill up, or as material is needed for truck loading, the chutes from the screens can be adjusted to discharge into special open-top bins from which the sand or gravel is removed and placed in the desired location in the storage by a 15-ton McMyler traveling electric crane equipped with a 1¾-yd. clamshell bucket, which receives current from a third rail. The entire storage accommodates 25,000 tons of material and is approximately 300 ft. long and 80 ft. wide having 10-in. concrete walls. At either end of it are four bins for loading trucks. Outside the storage and running parallel to it is a third railway track which permits the loading of cars by the crane at such times as the regular car-loading bins are empty or the plant not running. The storage, therefore, provides that the plant may operate whether cars are available or not and that cars may be loaded independently of the operation of the plant. The

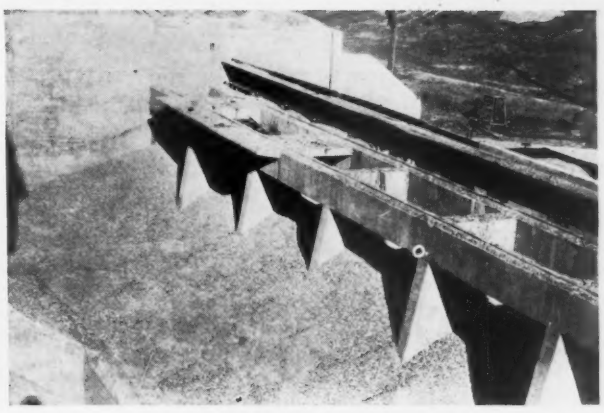


Ground plan showing general layout



Rejections from the screen are chuted and conveyed to this big roll crusher. Its product is chuted to the main conveyor

The 15-ton electric crane is fitted with a 1¾-yd. clamshell bucket and travels over 200 ft. of track in the storage

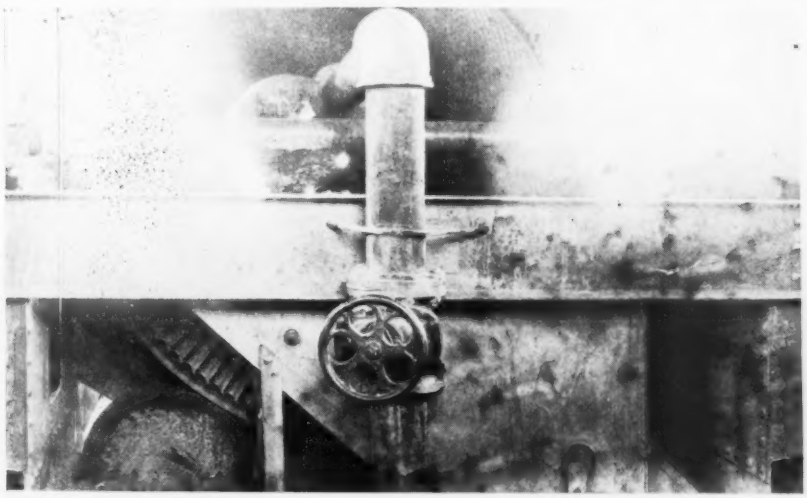


The opposite end of the storage. Gravel is piled at one end and sand at the other

plant, however, has so far been able to keep ahead of the demand.

Water is furnished the plant by an electrically driven 8-in. Morris centrifugal pump which is within a steel-framed house mounted on wheels. This outfit is mounted on an inclined track on the river bank and can be raised or lowered as desired according to the river stage. The pump house is provided with a self-winding reel for the cables to the motor.

The "Richard Hardy," a derrick boat named in honor of the company's president; the "T. R. Preston," a steamer, and a fleet of ten 150-ton capacity wooden barges make up the company's river equipment. The derrick boat also is fitted with an American derrick, which also is of latticed-steel construction with a 33-ft. mast, 65-ft. boom and 16-ft. bull-wheel. An American 10x12 three-drum hoisting engine, powered by a 100-hp. vertical boiler, operates the derrick. An 8x10 single-drum hoist of the same make is used for swinging. The derrick handles a 2-yd. Hayward orange-peel bucket which has been found readily applicable to the different gravel deposits. The digger, as well as the unloading and storage equipment, is equipped with wire rope lifting and guy lines.



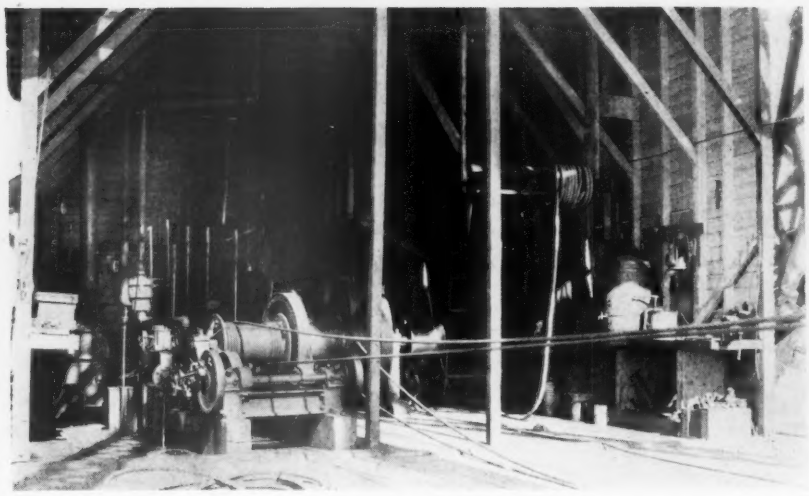
The material is washed in this 60-in. screen by means of a perforated 3-in. pipeline extending through it

Each of the drums of the hoisting engine are provided with niggerheads which are used for moving barges, changing the location of the digger itself and various other uses. Although the derrick boat is not provided with living quarters, its crew stays with it night and day, as a small houseboat is kept in tow.

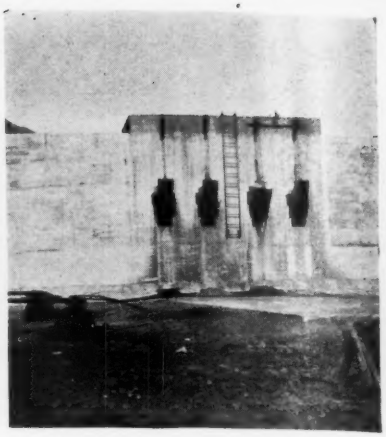
As shown in one of the illustrations, the company has provided dry docks for repairing its barges. These consist of three marine railways of slight incline extending from a point on shore 50 ft. from the river's edge and running 100 ft. into the river. On each of these tracks, mounted on wheels, is a flat frame made up of 8x10-in. timbers which is big enough to support and properly balance a barge. When a barge is mounted on one

The bins in the foreground are filled by gravity and the material is removed with the crane

Truck-loading bins at the end of the storage. These, too, of course, are filled by the crane



Under the "Richard Hardy's" roof. The levers of the main three-drum hoist and those of the single-drum hoist (swinging engine) are grouped



At the opposite end of the storage the sand bins for truck loading are within the storage

of the cars it is hauled to shore by an American No. 3 hand or horse-powered winch. Each railway is provided with a winch and the cables from each winch run through concrete culverts under the standard-gage loading tracks. The culverts also serve as a brace for the winches.

At the plant the company maintains a small office which handles the weighing, billing, and shipping as well as time-keeping, payrolls, etc. The offices take up the greater part of a 40x60-ft. concrete building. The remaining space in this building is given over to storage of small parts and supplies and also to an employes' locker and shower room.

Barges are floated on the marine railways and pulled ashore by these horse-powered winches

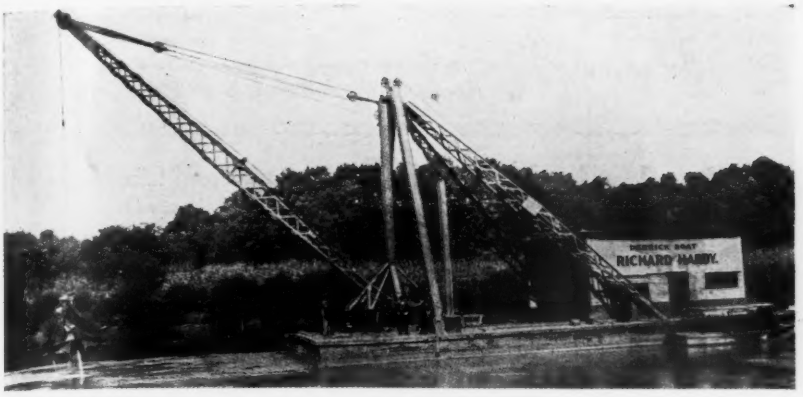
This pump house houses an 8-in. centrifugal pump, electrically powered. The house may be raised or lowered in harmony with the stage of the river

The first building (right) is the office and store room; in the center, the machine shop, and at the extreme left, the oil house

Adjoining this building is a machine shop and storage for the heavier duplicate parts and supplies. This building is 30x100 ft. and is also of concrete construction. The shop is fully equipped so that repairs can be made on any piece of machinery on the job. All machines and appliances are electrically driven. Next to the machine shop is an oilhouse of concrete construction and only oil for lubrication purposes is stored here.

Under normal conditions the Dixie company markets its products within a radius of 100 miles north, east, and west and 250 miles south of Chattanooga. Occasional shipments, however, have been made to points in southern Florida.

Among notable structures of the South in which its materials have been used are the Federal Reserve Bank building, At-



The derrick boat has a 33-ft. mast and 65-ft. boom and is shown in this view equipped with a 2-yd. clamshell bucket. Ordinarily an orange-peel bucket is used

lanta, and the Spring street viaduct which is now being built in that city.

The officials of the company and those responsible for its operation are: Richard Hardy, president; vice-president, George W. Miller; secretary-treasurer, George Kilian; sales and traffic manager, Henry B. Springer; superintendent, Chester Padgett; chief engineer, W. H. Klein, and plant foreman, W. J. Flach.

Flagstone Industry in Northeastern Pennsylvania

By R. W. Stone

QUARRYING flagstone for sidewalks once was a flourishing industry in northeastern Pennsylvania, but portland cement has virtually cornered the market in sidewalk material. Where once the quarries employed nearly 1000 men there are now less than 50 quarrymen, most of them doing a small, desultory business.

In the summer of 1922 the writer made a rapid reconnaissance through northern Pennsylvania of the quarries still being worked. An idea that the flagstone industry has some chance of recovering part of its lost business prompts this paper.

Flagstone is variously described as "a rock that splits readily into slabs suitable for flagging"; "a sandstone naturally separating into layers of suitable thickness for flagging; usually the layers are parallel to the bedding or stratification of the rock; but there are cases in which the lamination of the material available for flagging is the result of cleavage or jointing"; "a flat rock used in paving, or any rock which will split into such stones."

Flagstone produced in southeastern New York and northeastern Pennsylvania is also known as bluestone. Bluestone is the commercial name for a dark bluish-gray feldspathic sandstone or arkose. The color is due to the presence of fine black and dark-green minerals, chiefly hornblende and chlorite. The toughness of the rock, due to slight metamorphism, and the ease with which it may be split into thin slabs, adapt it for use as flagstone.

Bluestone is used as general building stone, for flagging and curbing, and as trimming for buildings—sills, lintels, steps, and base courses. Concrete is used extensively as a substitute for stone for these purposes. The use of crushed bluestone for railroad ballast is increasing.

This paper deals only with the use of bluestone as flagging and curbing, and kindred uses, such as burial vaults, cistern, cesspool and well covers. The largest use is for sidewalks. Flagstones vary greatly in size; the commonest size is about 4 ft. square and 2 in. thick. The largest stone square and 2 in. thick.

The flagstones of northeastern Pennsylvania are of Devonian age. The flagstone quarries are at various horizons in the lower part of the Catskill and upper part of the Chemung formations.

Development and Decline of Industry

Some of the Devonian sandstones where long exposed to rain and frost split easily along bedding planes into slabs from 2 to 8 in. thick and in lengths ranging from 2 to 20 ft., according to the space between the natural joints. This feature was early recognized by the settlers and the stone was quarried for buildings, walks, etc.

As the principal use for flagstone is for sidewalks, the demand increased as the population grew. The production of curbing was a somewhat later development and utilized some of the thicker flags. The climax of flagging and curbing industry was in 1906, when the value of the output exceeded $435,000. From that year production decreased almost regularly to about $27,000 in 1918.

The decline of the industry is ascribed to the increasing use of portland cement for making concrete walks. The abrupt decline from 1916 to 1918 ($90,144 to $26,991) may be assigned in part to high freight rates and to high wages. A total value of $4,000,000 for a local mineral product in 20 years, or an average of $200,000 per year, has been of material benefit to this corner of the state.

During the summer of 1922 the writer in a reconnaissance of the eastern half of the state stopped for a few minutes at such quarries as came to his notice. Some of the larger quarries on the Delaware river above Port Jervis are difficult of access from the Pennsylvania side and were not seen. Others that have long been producers are now idle and some are filled with water.

To the writer it seems unwarranted to assume that the production of flagstone in northeastern Pennsylvania can be developed into a very considerable industry in comparison with its present condition. Twenty years ago, hundreds of men were engaged in quarrying. The stone remains in the hills, but the demand now is light and few men find employment at the quarries. The development of the industry may be advanced by the organization and co-operation of the producers and by an advertising campaign conducted by the organization. Where flagstone can compete with concrete in price, the more attractive quality of the flagstone should give it preference. Flagstones are easily leveled, and single stones, if broken, can be matched in color and replaced without injury to the rest of the paving.

Esthetic rather than practical consideration may build up the flagstone industry. There are many people who care more for the beautiful than for cost; who want their walks pretty rather than prim. This desire should be fostered by the quarrymen. Some college buildings recently completed have been floored with flagstone. Irregularly cut flagstones of different colors laid in patterns make a floor that both wears well and pleases the eye. The stone yard at Meshoppen has furnished such flagstone floors for college buildings at Brown, Cornell, Princeton and Ann Arbor.

Illustrations in such monthly journals as *Country Life* and *House and Garden* show flagstones used for walks and pavement of terraces or uncovered porches in private grounds. The stones are cut in irregular shapes so as to give a less formal effect than rectangular slabs, and are purposely laid detached so that grass may grow between them. The demand for such purposes may never be large, but should be worth catering to.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	.....
Buffalo, N. Y.			1.30 per net ton all sizes			
Chaumont, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Coldwater, N. Y.			1.50 per net ton all sizes			
Eastern Pennsylvania	1.25	1.35	1.40	1.35	1.25	1.25
Munns, N. Y.	1.00	1.40	1.40	1.30	1.30	1.30
Prospect, N. Y.	.80	1.40	1.40	1.30	1.30	.....
Walford, Pa.	1.55	1.55	1.55	1.55	1.55	1.55
Watertown, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.50	.....	1.50	1.35	.....	.....
Buffalo, Iowa	.70	.....	1.35	1.15	1.20	1.20
Bloomville, Middlepoint, Dunkirk, Bellevue, Ohio	1.00	1.10	1.10	1.00	1.00	1.00
Chasco, Ill.	1.30	1.25	1.25	1.25	1.20	.....
Chicago, Ill.	.80	1.50	1.10	1.10	1.10	1.10
Dundas, Ont.	.95	1.35	1.35	1.35	1.10	1.10
Greencastle, Ind.	1.25	1.15	1.05	1.05	1.05	1.05
Krause, Columbia and Valmeyer, Ill.	1.20	1.20	1.30	1.30	1.30	1.30
Lannon, Wis.	.80	1.10	1.10	1.00	1.00	.90
Mitchell, Ind.	1.00	1.00	1.00	1.00	1.00	1.00
Montreal, Canada	.90	1.20	1.10	1.00	.95	.95
Montrose, Iowa	.....	1.50	1.60	1.55	1.45	1.40
Sheboygan, Wis.	1.10	1.10	1.10	1.10	.....	.....
Southern Illinois	1.35	1.25	1.25	1.25	1.20	.....
Stolle, Ill. (I. C. R. R.)	1.30	.....	1.35	1.35	1.35	1.35
Stone City, Iowa	.75	.....	1.50	1.40	1.35	.....
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
Waukesha, Wis.	1.00	1.00	Prices include 90c freight 1.00	1.00	1.00	1.00
SOUTHERN:						
Alderson, W. Va.	.75	1.25	1.40	1.25	1.15	.....
Bridgeport, Texas	1.10	1.40	1.35	1.35	1.25	1.25
Bromide, Okla.	.75	2.00	1.75	1.60	1.50	1.25
Cartersville, Ga.	1.25	1.75	1.75	1.15	1.15	1.15
Chickamauga, Tenn.	1.00	1.00@1.25	.....	1.00@1.25	.90@1.25	.....
El Paso, Texas	1.00	1.00	1.00	1.00	.....	.....
Ft. Springs, W. Va.	.80	1.50	1.50	1.40	1.40	.....
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	.....	.....	1.40	1.40	1.40	.....
Morris Spur (near Dallas), Tex.	1.25	1.25	1.40	1.40	1.40	1.25
WESTERN:						
Atchison, Kans.	.50	1.90	1.90	1.80	1.80	1.80
Blue Spr'gs and Wymore, Neb.	.20	1.65	1.65	1.55	1.45	1.40
Cape Girardeau, Mo.	1.35	.....	1.10	1.35	1.10	.....
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.50

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.50	1.35	1.15	1.00	.....
Bound Brook, N. J.	1.70	2.10	1.80	1.50	1.40	.....
Dresser Jct., Wis.	1.00	2.25	.....	1.75	2.00	.....
Duluth, Minn.	1.00	2.25	1.90	1.50	1.50	.....
E. Summit, N. J.	1.80	2.30	1.90	1.60	1.40	.....
Eastern Massachusetts	.85	1.75	1.75	1.40	1.40	1.40
Eastern New York	.75	1.50	1.50	1.30	1.40	1.30
Eastern Pennsylvania	1.25	1.55	1.50	1.40	1.40	1.40
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.50@2.00	1.35@1.50	1.15@1.25	1.00@1.10	.....
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	.....
Richmond, Calif.	.50*	.....	1.50*	1.50*	1.50*	.....
Spring Valley, Calif.	.70	1.55	1.50	1.40	1.35	1.35
Springfield, N. J.	2.00	2.20	2.20	1.80	1.75	1.60
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Atlanta, Ga.—Granite	1.47	2.07	2.07	1.97	1.97	.....
Buffalo, N. Y.—Granite	.90	.....	1.20	1.00	1.05	1.10
Berlin, Utley and Red Granite, Wis.	1.60	1.70	1.60	1.50	1.40	.....
Columbia, S. C.—Granite	.50	.....	2.25	2.00	2.00	.....
Dundas, Ont.—Limestone	1.00	1.35	1.35	1.25	1.10	1.10
Eastern Penna.—Sandstone	.85	1.60	1.55	1.35	1.35	1.30
Eastern Penna.—Quartzite	1.20	1.35	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	.75	1.75	1.50	1.35	1.25	1.25
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	.....	1.20	.....
Middlebrook, Mo.—Granite	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@1.50
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Sioux Falls, S. D.—Granite	1.00	1.60	1.55	.....	1.50	.....

*Cubic yard. †Agrl. lime. ||R.R. ballast. ‡Flux. ‡Rip-rap, a 3-inch and less.

Agricultural Limestone

(Pulverized)

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk	2.50
Grove City, Pa. — Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$; 60% thru 100 mesh; 45% thru 200 mesh; 100% thru 20 mesh; sacks, 5.00	3.50
Hillsville, Pa.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; sacks, 5.00; bulk	3.50
Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk	2.50
New Castle, Pa.—96% $CaCO_3$ 1.40% $MgCO_3$—75% thru 100 mesh, 94% thru 50 mesh; sacks, 5.00; bulk	3.50
Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk	3.00
Watertown, N. Y — Analysis, 96% **$CaCO_3$; .02% $MgCO_3$; 90% thru** 100 mesh; bulk, 3.00; sacks	4.50
West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$ — 50% thru 100 mesh; paper bags, 4.25—cloth, 4.75; bulk	3.00
Alton, Ill. — Analysis, 98% $CaCO_3$, 0.5% $MgCO_3$; 90% thru 100 mesh	6.00
Belleville, Ont.—Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk	2.50
Chasco, Ill.—Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$; 90% thru 100 mesh.. **90% thru 50 mesh**	5.00 1.35
Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh	1.80@3.80
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 90% thru 50 mesh; 80-lb. paper sacks	5.00
Bulk	3.50
Piqua, Ohio—100% thru 100 mesh; bulk, 5.50; bags	7.00
50% thru 100 mesh; bulk, 2.10; bags	2.25
80% thru 100 mesh; bulk, 3.50; bags	5.00
Cape Girardeau, Mo —Analysis, 93% **$CaCO_3$, 3.5% $MgCO_3$; 50% thru** 100 mesh	1.50
Hot Springs, N. C.—50% thru 100 mesh; sacks, 4.25; bulk	2.70
Knoxville, Tenn.—75% thru 100 mesh; bulk, 2.70; bags, 3.95; 80% thru 200 mesh; bulk, 3.50; bags	4.75
Linville Falls, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; bulk	2.75
Mountville, Va. — Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—50% thru 100 mesh; 100% thru 20 mesh; sacks	5.00
Colton Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk	4.00
Lemon Cove, Calif.—Analysis, 94.8% $CaCO_3$, 0.42% $MgCO_3$; 60% thru 200 mesh; sacks, 5.25; bulk	4.50

Agricultural Limestone

(Crushed)

Alton, Ill. — Analysis, 98% $CaCO_3$, 0.1% $MgCO_3$; 90% thru 50 mesh	1.50
Bellevue, Ohio — Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh	1.25
Bettendorf, Iowa, and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.25
Buffalo, Iowa—90% thru 4 mesh	1.00
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 100% thru 10 mesh, 90% thru 50 mesh	1.50
90% thru 4 mesh, cu. yd.	1.35
Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$; 90% thru 4 mesh	.80
Columbia, Ill., near East St. Louis—½-in. down	1.25@ 1.80
Elmhurst, Ill.—Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$; 50% thru 50 mesh	1.25
Huntington and Bluffton, Ind.—Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; about 20% thru 100 mesh	1.25

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Agricultural Limestone

(Continued from preceding page)

Greencastle, Indiana.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	2.00
Kansas City, Mo.—50% thru 100 mesh	1.50
Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh	1.20
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 32% thru 50 mesh; 51% thru 50 mesh; 100% thru 4 mesh; 83% thru 10 mesh; bulk	1.25
Milltown, Indiana.—Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$; 33.6% thru 100 mesh, 40% thru 50 mesh	1.25@ 1.65
Mitchell, Ind.—Analysis, 97% $CaCO_3$, 1% $MgCO_3$; 50% thru 100 mesh, 90% thru 4 mesh	1.25
Montrose, Iowa.—90% thru 100 mesh	1.25
Narlo, Ohio.—Analysis, 56% $CaCO_3$ 43% $MgCO_3$; limestone screenings, 37% thru 100 mesh, 55% thru 50 mesh, 100% thru 4 mesh	1.50@ 2.00
Ohio (different points), 20% thru 100 mesh, bulk	1.25@ 1.50
Piqua, Ohio—100% thru 4 mesh	1.25
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ¼-in. mesh	1.30
Stone City, Iowa. — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Toledo, Ohio —¼ in. to dust, 30% thru 100 mesh	1.50
Waukesha, Wis.—No. 1 kiln dried	2.00
No. 2 Natural	1.75
Alderson, W. Va. — Analysis, 90½ $CaCO_3$; 90% thru 50 mesh	1.75
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 90% thru 50 mesh	1.50
Cartersville, Georgia.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—all passing 10 mesh	1.75
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$; 90% thru 50 mesh	3.00
50% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	2.75
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Ladds, Ga.—50% thru 50 mesh	2.00
Garnett, Okla.—Analysis, 80% $CaCO_3$, 3% $MgCO_3$; 50% thru 50 mesh	.50
Kansas City, Mo., Corrigan Siding—50% thru 100 mesh; bulk	1.80
Tulsa, Okla.—90% thru 4 mesh	.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

Glass Sand:	
Berkeley Springs, W. Va.	2.25@ 2.50
Cedarville and South Vineland, N. J.—Damp, 1.75; dry	2.25
Cheshire, Mass.—Damp	2.50
Columbus, Ohio	1.50@ 2.00
Dunbar, Pa.—Damp	2.50
Falls Creek, Pa.	2.25
Hancock, Md.—Damp, 1.50; dry	2.00
Klondike and Pacific, Mo.	2.00@ 2.50
Mapleton, Pa.	2.25@ 2.50
Mapleton Depot, Pa.—Dry	2.75
Massillon, Ohio	3.00
Michigan City, Ind.	.50
Millville, N. J. (green)	2.00
Mineral Ridge, Ohio	3.00
Montoursville, Pa.	2.00
Oregon, Ill.	2.50
Ottawa, Ill.	1.50
Pittsburgh, Pa.—Dry, 4.00; damp	3.00
Rockwood, Mich.	2.50@ 2.75
Round Top, Md.	2.25
Sands, Pa.	2.50
San Francisco, Calif.	3.00@ 3.50
St. Louis, Mo.	2.50@ 3.00
Thayers, Pa.	2.25
Utica, Ill.	1.50
Zanesville, Ohio	2.00@ 2.50
Foundry Sand:	
Albany, N. Y.—Molding fine, coarse and brass molding	2.25
Sand blast (kiln dried)	4.00
Core	1.50
Allentown, Pa.—Core and molding fine	1.75@ 2.00
Arenzville, Ill.—Molding fine	1.50@ 1.75
Brass molding	1.75@ 2.00
Beach City, Ohio.—Core, washed and screened	2.00@ 2.50
Furnace lining	2.50@ 3.00
Molding fine and coarse	2.25@ 2.50
Cheshire, Mass.—Furnace lining, molding fine and coarse	5.00
Sand blast	5.00@ 8.00
Stone sawing	6.00
Cleveland, Ohio.—Molding coarse	1.50@ 2.00
Brass molding	1.50@ 2.00
Molding fine	1.50@ 2.25
Core	1.25@ 1.50

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Wholesale Prices of Sand and Gravel

Prices given are per ton, f.o.b., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Attica, N. Y.	.75	.75	.75	.75	.75	.75
Ambridge and So. Heights, Pa.	1.25	1.25	1.25	.85	.85	.85
Buffalo, N. Y.	1.10	.95			.85	
Erie, Pa.	.75		.90		1.10	
Farmingdale, N. J.	.48	.48	.75		1.10	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.	.50	.50	1.50		1.35	1.25
Machias, N. Y.	.75	.75	.85	.85	.85	.85
Pittsburgh, Pa.	1.25	1.25	1.25	.85	.85	.85
Portland, Me.		.50	1.75		1.35	1.35
Washington, D. C. (Rewashed, river)	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.50	.40				.90
Barton, Wis.	.60	.60	.70	.70	.70	.70
Beloit, Wis.		.70			.80	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.75@1.00
Des Moines, Iowa	.50	.50	1.25	1.60	1.60	1.60
			Unwashed ballast, .50 ton			
Dresden, Ohio	.70	.60	.60		.90	
Earlestead (Flint), Mich.	.70					
Eau Claire, Wis.	.40	.40@ .45	1.00@1.25			.85@ .90
Elkhart Lake, Wis.	.66	.60	.76	.76	.70	.70
Ft. Dodge, Iowa		1.22		2.17		
Grand Rapids, Mich.		.50		.80	.70	
Hamilton, Ohio	1.00	1.00	1.00		1.00	
Hawarden, Iowa	.60	.50			1.60	
Hersey, Mich.	.50	.50			.75	.75
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Iowa	.65	.65	1.75		.175	1.65
Mankato, Minn. (pit run)	.50	.50	.60			1.35
Milwaukee, Wis.	1.11	1.11	1.36	1.36	1.36	1.36
Minneapolis, Minn.	.35	.35	1.25@1.35	1.25@1.35	1.25	1.25
Moline, Ill.	1.00	1.00	1.30	1.30	1.30	1.30
Riton, Wis.		.40			.60	
St. Louis, Mo., f.o.b. cars	1.20	1.45		1.45		1.45
St. Louis, Mo., deliv. on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.65@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75
Terre Haute, Ind.	.75	.75	.75	.90	.90	.90
Waukesha, Wis.	.50	.50	.80	.80	.80	.80
Winona, Minn.	.40	.40	1.25	1.10	1.10	
			(.05 ton discount 10 days)			
SOUTHERN:						
Atlanta, Ga.	.75	.75		.90	.90	.90
Birmingham, Ala.	1.48		all gravel 1.88			
Charleston, W. Va.	all sand 1.40		all gravel 1.50			
Estill Springs, Tenn.	1.35	1.35		1.00	.85	.65
Ft. Worth, Texas	1.75	1.75	1.75	1.75	1.75	1.75
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	1.00	1.00	1.00	1.00	1.00	1.00
Lake Weir, Fla.		.60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.00	1.00	1.80	1.80	1.80	1.80
N. Martinsville, W. Va.	1.00	1.00		1.20	1.00	.80
New Orleans, La.	.25			.85		
Roseland, La.	.50		.85	.85		
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.		(Kaw river sand, car lots, .75 per ton; Missouri river, .85)				
Los Angeles, Calif.		.70	1.20	1.20	1.10	1.10
Pueblo, Colo.	1.10*	.90*		1.50*		
San Diego, Calif.†	.50@ .70	.80@1.00	1.30@1.80	1.35@1.65	1.10@1.40	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.25*	1.25*	1.50*	1.75*	1.25*	1.25*
Spring Valley, Calif.	.70	.80	1.40	1.35	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine sand, 1/10 in.	Sand, ¼ in.	Gravel, ½ in.	Gravel, 1 in.	Gravel, 1½ in.	Gravel, 2 in.
Atlanta, Ga.	.30@ .40	.30@ .40				
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, .80 per yd.			
Cherokee, Iowa			.80 per ton—1.20 washed			
Dresden, Ohio		.60				
Dudley, Ky. (crushed sand)	1.00	1.00		.90		
East Hartford, Conn.			.65 per cu. yd.			
Elkhart Lake, Wis.	.70	.50			.60	.60
Estill Springs, Tenn.						.85
Fishers, N. Y.		.50@ .65		.50@ .65		
Grand Rapids, Mich.						.50
Hamilton, Ohio					.70	
Hartford, Conn.		1.00*				
Hersey, Mich.			.55			
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Texas						.55
Janesville, Wis.		.65			.65@ .75	
Montezuma, Ind.			Road gravel .50 per ton			
Pine Bluff, Ark.			Road gravel .50			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			Bank run gravel 1.55			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Texas		.80		1.50		1.30
Winona, Minn.	.40	.40	.60	.60		
York, Pa.		1.00@1.20	(crushed rock sand)			

* Cubic yard. B Bank. L Lake. || Ballast. † Low prices, wholesale; high prices, retail.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1¼ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.15	1.10
Eastern Penn. and Northern N. J.	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.50	.80	1.25	1.00	.90	.90	.90
Erie, Pa.		Crushed run slag, 4 in. and less, 1.25@1.35					
Emporium, Pa.			1.35	1.35	1.35	1.35	1.35
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Penn.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, 1.50, f.o.b. Chicago				
Detroit, Mich.			All sizes, 1.65, f.o.b. Detroit				
Ironton, O.	2.05	1.45	1.80	1.45	1.45	1.45	1.45
Jackson, O.		1.35		1.35	1.35	1.35	1.35
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.50	1.35	1.35	1.35	1.35	1.35	1.35
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.30	1.40	1.40	1.30	1.30	1.30
Steubenville, Lowellville, Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton and Low Moor, Roanoke, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Adams, Mass.			7.00				2.90	
Bellefonte, Pa.		10.50§	10.50§	10.50§	9.00		8.50	1.80
Buffalo, N. Y.				12.50				
Berkeley, R. I.			12.00					2.30
Cassadaga, N. Y.			Agricultural marl 7.00@10.00					
Chaumont, N. Y.					2.50	4.00		
Lime Ridge, Pa.							5.00	
West Rutland, Vt.	13.50	12.00					11.00	3.20
West Stockbridge, Mass.								2.25
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		11.50	11.50	12.50				1.85
Zylonite, Mass.	3.20d	2.90d	7.00					
CENTRAL:								
Cold Springs, Ohio		11.00	11.00				10.00	
Delaware, Ohio	12.50	11.00	10.00	12.00			10.00	1.60
Gibsonburg, Ohio	12.50				9.00		10.00	
Huntington, Ind.		11.00						1.60
Luckey, Ohio	12.50a		10.00a		9.00			
Marblehead, Ohio		11.00	10.00				10.00	1.60
Marion, Ohio		11.00	10.00				10.00	
Mitchell, Ind.				12.00	11.00		10.00	1.60
Sheboygan, Wis.								7.50d
White Rock, Ohio	12.50				9.00	11.00		
Woodville, O. (dlrs.' price)	12.50a	11.00a	10.00a		9.00		10.00	1.60
SOUTHERN:								
Erin, Tenn.							8.50	1.50
El Paso, Texas							9.00	1.50
Karo, Va.							7.00	
Knoxville, Tenn.	12.50	11.00	11.00	11.00	9.00		9.00	1.50
Ocala and Zuber, Fla.	14.00	14.00		14.00				1.75
Sherwood, Tenn.	12.50	11.00	11.00	11.00			8.50	1.50
Staunton, Va.					4.50	5.50	8.50	1.35
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. M.							12.50	
San Francisco, Calif.	21.00	21.00	15.00	21.00			18.00	2.15*
Tehachapi, Calif.							13.00	2.00

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §paper sacks. (a) 50-lb. paper bags; terms, 30 days net, 25c per ton or 5c per barrel discount for cash in 10 days from date of invoice; (b) burlap bags; (c) 200-lb. barrels; (d) 280-lb. barrels net.

Miscellaneous Sands

(Continued from preceding page)

Columbus, Ohio.—Core	.50@ 2.00
Sand blast	4.50@ 5.50
Molding fine	2.75@ 3.00
Molding coarse	2.00@ 2.50
Brass molding	2.50
Furnace lining	2.00
Molding coarse	1.75@ 2.00
Stone sawing	1.50
Traction	.70@ 1.00
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.15
Dunbar, Pa.—Traction, damp	2.50
Dundee, Ohio.—Glass, core, sand blast traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Eau Claire, Wis.—Core	1.00@ 1.25
Sand blast	3.25@ 3.75
Falls Creek, Pa.—Molding, fine and coarse	1.75
Sand blast	2.00
Traction	1.75
Franklin, Pa.—Core	2.00
Furnace lining	2.50
Molding fine and coarse	2.00
Brass molding	2.00
Greenville, Ill.—Molding coarse	1.30@ 1.50
Joliet, Ill.—No. 2 molding sand and loam for luting purposes; milled	.80
Bank run	.65
Kansas City, Mo.—Missouri river core	.80
Kasota, Minn.—Molding fine	1.60@ 1.85
Molding coarse, stone sawing	1.45@ 1.75
Klondike, Pacific, Gray Summit, Mo.—Molding fine and coarse	2.00
Mapleton Depot, Pa.—Furnace lining, dry	2.75
Molding fine, damp	2.00
Mapleton, Pa.—Glass, core, furnace lining, molding fine and coarse; damp, 2.00; dry	2.75
Massillon, Ohio—Molding fine and coarse, furnace lining, core, traction	3.00
Michigan City, Ind.—Core, traction	.50
Mineral Ridge, Ohio.—Core (green)	2.25
Furnace lining, molding fine and coarse; roofing sand, sand blast, stone sawing, traction brass molding (green)	2.00
Montoursville, Pa.—Core	1.35@ 1.40
Traction	1.00@ 1.10
Brass molding	1.25
New Lexington, Ohio—Brass molding	2.25
Molding coarse	2.00
Oregon, Ill.—Core	1.50@ 2.00
Sand blast	4.00
Stone sawing	2.00@ 2.50
Ottawa, Ill.—Core	1.50@ 2.00
Furnace lining and traction	1.50
Roofing sand	1.75
Sand blast	4.50
Stone sawing	3.00
Brass molding	2.50
Ottawa, Minn.—All crude silica sand	.75@ 1.00
Rockwood, Mich.—Core	1.90@ 2.50
Roofing	2.75
Sand blast	3.75

Miscellaneous Sands

(Continued)

Round Top, Md.—Core (damp)	1.60
Traction (damp)	1.75
Roofing sand	2.25
San Francisco, Calif. (washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@ 3.50
(Direct from pit)	
Furnace lining, molding coarse, sand blast	3.60
Stone sawing, traction	2.30
St. Louis, Mo.—Red heavy molding	1.50@ 2.25
Red fine	1.50@ 2.00
Molding fine and brass	2.00@ 3.00
Skein core	1.75@ 2.25
White core sand	1.00@ 1.75
Sand blast	2.00@ 4.50
Furnace lining	1.50@ 2.50
Sand blast	2.00@ 4.50
Roofing sand	1.00@ 1.50
Stone sawing	1.25@ 2.00
Thayers, Pa.—Core	2.00
Furnace lining, molding fine and coarse	1.25
Traction	2.25
Utica, Ill.—Core, stone sawing	1.25
Furnace lining	1.50
Molding fine	.90
Molding coarse	1.00
Warwick, Ohio.—Furnace lining, dry 2.75, green	2.00
Molding fine and coarse, dry 2.75, green	1.75
Traction and brass molding	2.50
Zanesville, Ohio.—Molding fine, brass molding	1.75@ 2.00
Molding coarse	1.50@ 1.75

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Asheville, N. C.—Best white and 200-mesh (per ton)	8.00
Yellow (per ton)	9.00
Red (per ton)	13.00
Baltimore, Md.—Crude talc (mine run)	3.50
Ground talc (20-50 mesh), bags	10.00
Ground talc (150-200 mesh), bags	12.00
Cubes	60.00
Blanks (per lb.)	.08
Chatsworth, Ga.—Grinding	7.00
Ground talc (150-200 mesh); bags	15.00@20.00
Pencils and steel workers' crayons (gross)	1.50@ 2.50
Chester, Vt.—Ground talc (150-200 mesh), bulk	6.50@ 8.50
(Bags 1.00 extra)	
Emeryville, N. Y.—325 mesh (double air floated), bags	14.75
Glendale, Calif.—Ground talc (150-200 mesh)	16.00@30.00
(Bags extra)	
Ground talc (50-300 mesh)	13.50@15.50
200 mesh	13.50@14.50
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run) per 2000-lb. ton	2.75@ 3.50
(150-200 mesh), bags	9.75@12.50
Los Angeles, Calif.—Crude talc f.o.b. Silver Lake	7.00@12.00
Ground talc (150-200 mesh), 100-200 lb. bags)	12.00@14.00
Mertztown, Pa.—Ground talc (20-50 mesh); bulk, 5.00; bags	6.00
(150-200 mesh); bulk, 7.00; bags	8.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	7.50@10.00
Ground talc (150-200 mesh); bags	8.50@13.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	5.00
(Bags 1.00 extra)	
Ground talc (150-200 mesh), bulk	8.00@14.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

(Raw Rock)

Per 2240-lb. Ton

Centerville, Tenn.—B.P.L. 65%	6.00@ 8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 68-72%	6.00@ 6.50
Tennessee—F.o.b. mines, long tons, unground Tennessee brown rock, 72% B.P.L.	7.00
Mt. Pleasant, Tenn.—Analysis, .65-70% B.P.L. (2000 lb.)	6.50
Paris, Idaho.—2000 lb. mine run, B.P.L. 70%	3.50

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$8.40	$8.10	$7.50
24x14	10.20	8.40	8.10	7.50
22x12	10.80	8.70	8.40	7.80
22x11	10.80	8.70	8.40	7.80
20x12	12.60	9.00	8.70	8.10
20x10	12.60	9.00	8.70	8.10
18x10	12.60	9.00	8.70	8.10
18x 9	12.60	9.00	8.70	8.10
16x10	12.60	8.70	8.40	7.80
16x 9	12.60	8.70	8.40	7.80
16x 8	12.60	8.70	8.40	7.80
18x12	12.60	9.00	8.70	8.10
16x12	12.60	8.70	8.40	7.80
14x10	11.10	8.40	8.10	7.50
14x 8	11.10	8.40	8.10	7.50
14x 7 to 12x6	9.30	8.10	7.50	7.50
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

(Ground Rock)

Wales, Tenn.—B.P.L. 70%	7.75
Per 2000-lb. ton	
Barton, Fla.—Analysis, 50-65% B.P.L.	3.50@ 8.00
Centerville, Tenn.—B.P.L., 60-65%	6.50
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68-72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Montpelier, Idaho. — Analysis, 72% B.P.L., crushed and dried	3.75
Mt. Pleasant, Tenn.—B.P.L. 65%	6.50@ 7.00
Twomey, Tenn.—B.P.L. 65%	6.50

Florida Soft Phosphate

(Raw Land Pebble)

Per Ton

Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.)	3.25
70% (min.)	3.50
Jacksonville (Fla.) District	10.00@12.00

(Ground Land Pebble)

Per Ton

Jacksonville, Fla., District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	5.95

Fluorspar

Fluorspar—80% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	22.00
Fluorspar—85% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	23.50

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	16.00@20.00	16.00@20.00
Slate granules		7.00
Granville, N. Y.—Red slate granules		7.50
Harrisonburg, Va.—Blk. marble (crushed, in bags)		12.50
Ingomar, Ohio (in bags)	6.00@14.00	10.00@25.00
Milwaukee, Wis.		16.00@32.00
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsb'g, N. J.—Green stucco dash	16.00@20.00	
Poultney, Vt.—Slate granules		7.50
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.—(2000 lb.)		7.00@12.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags 12½c extra	4.50	4.50

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@35.00
Carpenterville, N. J.	18.50	31.50@41.50
Easton, Pa.	16.00	40.00@60.00
Ensley, Ala.	16.00	26.00
Eugene, Ore.	25.00@26.00	50.00@75.00
Friesland, Wis.	22.00	32.00
Houston, Tex.		19.50
Omaha, Neb.	18.00	30.00@40.00
Portland, Ore. (Del'd)	21.00	45.00@75.00
Puyallup, Wash.	20.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
St. Paul, Minn.	15.00	30.00@45.00
Salem, Ore.	25.00	35.00@50.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Springfield, Ill.	18.00	20.00@25.00
Wauwatosa, Wis.	14.00@15.00	26.00@65.00
Watertown, N. Y.	21.00@22.50	35.00@37.50
Winnipeg, Can.	18.00	26.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	11.00
Boston, Mass.	15.00@16.50
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
Grand Rapids, Mich.	12.00
Lancaster, N. Y.	14.00
Michigan City, Ind.	11.00
Milwaukee, Wis. (delivered)	14.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Rives Junction, Mich.	12.00
Saginaw, Mich.	12.00
San Antonio, Texas	13.00
San Antonio, Texas (deliv. city lts.)	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	17.00
F. o. b. cars	15.00
Washington, D. C.	14.50

Gray Clinker Brick

El Paso, Texas	13.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	23.50	15.00
Baltimore, Md.	24.25	17.25
Cincinnati, Ohio	16.80	13.40
Chicago, Ill.	20.00	20.00
Dallas, Tex.	22.50	.....
Denver, Colo.	24.00	.....
Detroit, Mich.	21.00	20.00
Kansas City, Mo.	28.00	24.00
Minneapolis, Minn. (white)	25.50	21.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	.....
New York, N. Y.	18.20	13.10
Philadelphia, Pa.	16.00	15.00
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	16.00
Seattle, Wash. (paper sacks)	24.00	.....

Portland Cement

Current prices per barrel in carload lots f. o. b. cars, without bags.

Atlanta, Ga.	2.80
Boston, Mass.	3.18‡
Buffalo, N. Y.	3.03‡
Cedar Rapids, Iowa	2.48
Cincinnati, Ohio	2.54
Cleveland, Ohio	2.46
Chicago, Ill.	2.20
Dallas, Texas	2.25†
Davenport, Iowa	2.43
Denver, Colo.	2.65
Detroit, Mich.	2.48
Duluth, Minn.	2.14
Indianapolis, Ind.	2.41
Kansas City, Mo.	2.45
Los Angeles, Calif. (less 5c discount)	3.26
Milwaukee, Wis.	2.37
Minneapolis, Minn.	2.39
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.83
New York, N. Y.	2.80‡
Philadelphia, Pa.	2.96‡
Phoenix, Ariz.	3.70
Pittsburgh, Pa.	2.24
Portland, Ore.	3.05
San Francisco, Calif.	3.03@3.15**
St. Louis, Mo.	2.35
St. Paul, Minn.	2.39
Seattle, Wash.	2.90*
Toledo, Ohio	2.48

NOTE—Add 40c per bbl. for bags.
**+warehouse.
‡Including sacks; 10c bbl. discount 10 days.
*10c bbl. discount.
†Bags 15c.

F.O.B. Mill Prices, Bulk

Buffington, Ind.	1.95
Cincinnati, Ohio	3.00†
Concrete, Wash.	2.60
Dallas, Texas	2.15
Dayton, Ohio	2.85†
Hudson, N. Y.	2.60
Indianapolis, Ind.	2.96†
Los Angeles, Calif.	2.80
Louisville, Ky.	2.92†
Memphis, Tenn.	3.24†
Steelton, Minn.	1.95
Universal, Pa.	2.00

†Including cloth sacks.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	Plaster Board ⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard. ⅜x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	.....	6.00	6.00	.....	13.00	.....	.....	.....	.....	.....	.....	.....	.....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	20.00	.....	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	.....	5.00	10.00	10.00	10.00	.....	.....	31.00	.....	19.75	20.00	30.00
Hanover, Mont.	4.50	.....	6.00	10.00	.....	10.50	.....	.....	.....	.....	.....	.....	.....
Mound House, Nev.	.....	8.50	6.50	10.50@11.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00	.....	.....	10.00	11.00	11.50	.....	.....	33.75	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	.....	16.40	.....	.....	.....	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ‖Bulk; (a) Includes sacks.

News of All the Industry

Incorporations

The Northern Quarries, Inc., Milwaukee, Wis., has been incorporated for $150,000 by W. Unke, M. A. Becker and O. C. Unke.

The Cambria Sand and Stone Co., Ebenburg, Pa., has been incorporated for $100,000 by C. S. Evans.

The Quality Concrete Products Co. has been incorporated at Wilmington, Del., for $30,000. Corporation Service Co. is the attorney.

The Superior Slate Co. has been incorporated at Wilmington, Del., for $150,000. The Colonial Charter Co. is attorney.

The Cushing Brick Co., Cushing, Okla., has been incorporated for $25,000 by J. B. Bellis, A. Brandenberg and J. M. Dale, all of Cushing.

The Sandy Hill Sand Co., 1155 Bond street, Patterson, N. Y., has been incorporated for $100,000.

The Southern Rock Asphalt Co., Dover, N. Y., has been incorporated for $600,000. Attorney is Corporation Trust Co. of America.

The East Kentucky Rock Asphalt Co., Inc., Soldier, Ky., has been incorporated for $150,000 by W. C. West, S. T. Randle, E. W. Randle, J. W. Wilhelm, Jr., H. G. Foster, F. H. Engelken, Lexington, Ky.

The Atlas Portland Cement Co., Independence, Kans., has been chartered with a capital of $2500 by W. N. Banks, C. F. Stewart and J. P. Rucker.

The Woodstock Granite Quarry Co. has been incorporated in Towson, Md., for $50,000 by J. Murray, W. J. Peach and E. H. Burke.

The Universal Granite Co. has been incorporated in St. Cloud, Minn., for $50,000 by J. F. Trebteske and M. A. Trebteske.

The Superior Rock Products Co. has been incorporated in Marquette, Mich., for $2500.

The Barry Sand Co. has been incorporated in Saginaw, Mich., for $25,000.

The Pounding Mill Quarry Corp. has been chartered in Roanoke, Va., for $300,000. J. P. Woods is president: F. W. Rogers, secretary.

The Blue Ridge Stone Corp. has been organized in Roanoke, Va., with a capital of $300,000. J. P. Woods is president and F. W. Rogers, secretary.

The Winchester Gravel Co., Winchester, Ind., has been incorporated for $35,000 by E. M. Clark, A. E. Fudge, E. Clark and W. H. Fudge.

The Aluminate Cement Co., Philadelphia, Pa., has been incorporated for $15,000. The attorney is the Corporation Guarantee & Trust Co.

The North State Feldspar Corp. has been chartered in Micaville, N. C., for $100,000 by B. B. Silver, T. S. Huges, R. C. Hill.

Sand and Gravel

The Northwestern Gravel Co., Des Moines, Iowa, has been awarded the contract to furnish 5000 tons of gravel at $1.20 a ton by the Woodbury county board of supervisors. The board has also secured option on 7000 more tons at the same price per ton. The gravel will be used in the construction of paving on the King of Trails and Denison highway, between Sioux City and the county line.

The Acme Sand Co., Eutis, Fla., has inquiries out for a 60-hp. marine type Diesel engine, with auxiliary equipment.

The Veberly Stone & Sand Co., Liberty, S. C., has inquiries out for a 30 to 36-in. gyratory crusher, 48-in. revolving screen, conveyor equipment and other machinery.

The Rock River Sand and Gravel Co., Dixon, Ill., is erecting a $10,000 plant on Rock river. The plant will be in operation shortly and will have a capacity of 300 cu. yd. per day. H. Franks and E. Lloyd are the owners.

Mercer & McKay, Eagle Rock, Calif., will develop the large gravel pits near Montrose, which they have recently purchased. Bramble of Eagle Rock has also purchased a gravel deposit and has a contract to supply gravel to the city of Los Angeles.

The Industrial Sand and Gravel Corp., recently incorporated in Lawton, Okla., with a capital of $60,000, has organized with E. B. Dunlap, president, and C. E. Douglas, secretary and manager, to develop 160 acres near Cashe, Okla. The plant will have a daily capacity of 25 cars.

Southern Minerals Co., Cleveland, Tenn., has purchased an 8-ft. x 36-in. Hardinge pebble mill to grind silica.

The Standard Gravel and Material Co., 106 East Seventh street, Topeka, Kans., has leased about 900 acres of gravel deposits in the Neosho river, near Neosho Rapids, where its plant is located. The plant has a capacity of 10 carloads a day. H. A. Kingsley is president; F. B. Bonebrake, secretary-treasurer; O. W. Sanders, sales manager; W. L. Stark, superintendent.

The Dusch Sand Co. is repairing its sand loading machinery at Spenceville, Kans., and will be in operation all summer.

The Mound Street Sand and Gravel Co., Columbus, Ohio, has started operations in the Sciota river. The plant is equipped with modern machinery, a washing, screening and crushing machine, and a cableway excavator with a 300 to 700-tons capacity per day. J. P. Hickey is manager.

The Wolf River Sand Co., Nashville, Tenn., has increased its capital stock from $45,000 to $90,000.

The Independence Sand and Gravel Co., Dallas, Ore., has the contract to furnish crushed rock and sand for 3.1 miles of Pacific highway calling for 250 yd. daily.

The New Riverside Ochre Co., Cartersville, Ga., has purchased a 3-ft. by 8-in. Ball mill to grind ochre sand.

The Boston Sand and Gravel Co., Boston, Mass., producers of washed sand and gravel, announces its entrance into the retail field to deal directly with the contractors, builders, masons, plasterers and all users of sand and gravel, and is prepared to give immediate delivery service on all orders, large or small. The Atlas Trucking Co., a new corporation that the Boston company controls, will do the major part of its trucking.

The Blue Mountain Stone Co., Hagerstown, Md., recently organized with a capital of $500,000, has leased the Blue-Black Slate Quarries, Delta, York county, Pennsylvania, and contemplates the erection of a new plant for the production of slate granules for use in roofing manufacture. Crushing, grinding, pulverizing and other machinery will be installed. The plant will cost $80,000.

Lime

The Superior Lime and Hydrate Co., Pelham, Ala., of which H. C. Bridgewater is secretary and plant manager, has a $75,000 fireproof building under construction and most of the equipment purchased for a mill of 500 bbl. per day capacity.

The Southern California Lime and Cement Co., 1003 South Fremont, Alhambra, Calif., is about to begin erection of a $3300 warehouse.

The Blue Diamond Materials Co., 16th and Alameda streets, Los Angeles, Calif., has begun operating its plant, using raw material from one of the three purest gypsum deposits found in the United States, and shipping it in from the nearby quarry, where its crushing plant is in operation.

The Pacific Lime and Plaster Co., recently incorporated for $100,000, will have its principal office in San Francisco, Calif. Directors are C. W. Coburn, F. C. Price, San Francisco; C. J. Waterhouse, W. O. Badgley and R. M. Lyman, all of Oakland.

The Crystal Carbonate Lime Co., whose plant was recently destroyed by fire at Elsberry, Mo., may move its location to Louisiana, Mo.

The Rockland and Rockport Lime Corp., Rockland, Maine, announces President G. B. Wood has a new scale of wages, effective in all regular departments of the plant, based on a general average increase of 5 cents per hour. This new scale was put into effect on June 3.

The Kaweah Lime Products Co., Woodville, Calif., is increasing its production from 90 to 175 tons a day.

The Pacific Limestone Products Co., Oakland, Calif., has purchased 10 acres at Santa Cruz and will produce agricultural lime.

The Western Lime and Cement Co., Milwaukee, Wis., will again operate its lime kilns at West Kewaunee after a shut-down of a few years. High freight rates was the cause of suspension of operations at the plant and much of the machinery was removed. Machinery will be installed for crushing stone for road work.

Phosphate Rock

The Chemical Construction Co., Charlotte, N. C., Peter S. Gilchrist, president, has plans in preparation for the construction of a new phosphate plant on the site along the Hillsborough river at Tampa, Fla. It will consist of a number of buildings, with power house, and equipped for the manufacture of superphosphate, about 44 to 47 per cent pure. The plant with machinery will cost in excess of $1,000,000. The Tampa Board of Trade is interested in the project.

Quarries

The Marengo Limestone Co., Marengo, Ind., will open its quarry, which will be in charge of John F. Tegart, New Albany, who has been appointed receiver, and will operate the plant on an extensive scale. Dissatisfaction among stockholders of this $100,000 concern is assigned for the present trouble. The company is in prosperous condition, it is said.

The W. H. Loomis Talc Co., Gouverneur, N. Y., is perfecting plans for the installation of hoisting, conveying and other machinery at its properties.

The Genesee Stone Products Co., Batavia, N. Y., is planning the installation of stone-crushing machinery, power, conveying and other equipment. A. B. Caldwell is in charge.

The Hawkeye Felstone Co., Mead, Wash., reports the magnesite cement industry is keeping its plant operating at capacity. Most of the product is being used for flooring and stucco. Recently a method has been perfected whereby coloring can be secured with evenness and permanency.

The Conley Stone Co. is making improvements at its plant at Perryville, N. Y., to double its output of crushed stone and limestone. It is now shipping 15 cars per day.

The American Magnesium Co. is building a 30-mile mono railroad to its property and will erect a refining plant at San Pedro Harbor, Calif.

Hoffman and Flynn, Los Angeles, Calif., have leased a tract at Claremont, Calif., as the representatives of a company which proposes to establish a $250,000 rock crushing plant thereon.

The Birdsboro Stone Co., Land Title building, Philadelphia, is planning to rebuild its crushing plant and power house at Birdsboro, Pa., destroyed by fire May 21, with loss estimated at $250,000, including machinery.

Cement

The **Universal Portland Cement Co.**, Universal, Pa., has acquired 231 acres, with buildings, in the vicinity of its plant, heretofore held by the Carnegie Steel Co., and will use a portion of the property for expansion. Headquarters are at 210 South La Salle street, Chicago.

The **Arrowhead-Portland Cement Co.** has started on its plant near Devore, Calif. W. H. E. Bravender, president and general manager of the company, left San Bernardino with a crew of men to start preliminary construction. The crushers will arrive in about six weeks, and when installed actual operations will start. By the time of their erection it is expected the aerial cableway with a 250-ton an hour capacity will be finished and much ore excavated, so that there will be no delay in operations. The plant will be erected in two units of 1500 bbl. each. The company owns 600 acres of land and chemists have analyzed it at 99½ per cent high calcium carbonate and ½ per cent magnesia. Capitalized at $2,000,000, the company is offering its stock at $10 a share.

The **Santa Fe railroad** reports the Dallas, Texas, "Herald" will construct more than two miles of track from Hale, near Oak Cliff, to the West Dallas industrial district, to cost about $250,000. This territory is occupied by several large portland cement plants, gravel companies, etc. Negotiations have been carried on for many years to accomplish this work.

The **Linwood Stone and Cement Co.**, Davenport, Iowa, has preliminary plans under way for the construction of a new cement manufacturing plant to cost close to $200,000, including equipment. J. E. Schroeder is secretary.

The **Dewey Portland Cement Co.**, Dewey, Okla., is reported to build a cement plant at Buffalo, Iowa.

The **South Dakota State Cement Commission** is about to begin construction of a raw storage building at its plant in Rapid City, S. D.

Pueblo, Colo.—Work on the new cement plant to be erected near Pueblo, reported in Rock Products for May 5, p. 63, will start soon. Option on more than 8000 acres have been taken. The company will be known as the Arkansas Valley Portland Cement Co. It has a capital stock of $3,000,000.

The **National Portland Cement Co.** has been incorporated, with headquarters at Montreal, Que. The plant will have a capacity of 3000 bbl. a day, and will be built of reinforced concrete at an approximate cost of $1,800,000. Estimated output will be about 900,000 bbl. a year. Construction of the mill was commenced May 1 of this year and will probably take about nine months to complete.

The **Signal Mountain Portland Cement Co.**, Signal Mountain, Tenn., has work nearing completion on its new local cement manufacturing plant and plans to finish the machinery installation during July. The plant will represent an investment of close to $2,000,000. It will have a capacity for handling 12,000 bbl. of materials a day.

The **Overland Cement Plaster Co.**, Laramie, Mont., has received a check for $1019.80, the principal, interest and court costs for taxes erroneously assessed on the valuation of its property at Laramie for hte year 1922 by the state board of equalization.

Agstone

W. J. Watson has discovered a large deposit of limestone on his farm at Hunters Point, near Lebanon, Tenn. The rock runs in layers of 5, 7, 11 and 13 ft. underlies. The rock tests 96.65 per cent $CaCo_3$, 1.58 per cent $MgCo_3$ and only 1.77 per cent impurities. The limestone when ground, sacked and ready for shipment will be worth $18 per ton for agricultural purposes.

The **State College of Agriculture** Columbia, Mo., reports that over 100 communities in Missouri have taken or about to take steps to put in co-operative stone crushing plants to produce their own crushed stone for fertilizing. The college is making tests of the soil and giving advice.

The **Co-operative Elevators** of Monroe County, Missouri, have agreed to carry pulverized limestone in stock, so farmers may get it at any time for fertilizing purposes.

E. J. Rice, Springfield, Mo., reports that a limestone quarry has been opened up on his farm, 12 miles west of Houston, Texas. Tests showed the stone is 93.85 pure lime. A crusher will be installed and the product sold to farmers for agricultural uses.

L. F. Boyle, Hennepin, Ill., reports after the application of limestone to a sandy type of soil was given, the sweet clover is thick and a foot high on his farm.

J. H. Miller, Granville, Ill., recently stated that the effects of limestone applied seven or eight years ago still showed in the clover crop of last year. The limestone used in Illinois is the raw limestone. While it is not quickly available in neutralizing the acid in the soil, its lasting results and cheapness make it preferable.

The Bernal Marl Fertilizer Co. operates a quarry and pulverizer plant near Eden Vale, Santa Clara county, California, with a capacity of 500 tons daily. The use of limestone as a fertilizer has brought a need for shorter transportation and this has had a tendency to bring about the opening of cement plants in the central and north portions of California. Four plants are now operating in each of these counties, San Benito, Santa Cruz, Contra Costa and Solano. Many new deposits are being studied.

Concrete Products

The G. W. Martin Concrete Block and Supply Co., 10577 West Jefferson street, Detroit, Mich., has been incorporated for $2000.

The Concrete Engineering Products Co. has been incorporated in Charleston, W. Va., by A. K. Fleming, A. H. Stork and R. T. Whitnall for $25,000.

The Colorado Portable Concrete Building Corp. has been incorporated in Denver, Colo., for $50,000 by C. A. Fertig, L. W. Kennedy and O. E. Garwood.

The Prekast Concrete Co., Culver City, Calif., has been incorporated for $20,000 by M. J. Francis, V. W. Merritt and others.

The McArthur Concrete Tile and Foundation Co. has been incorporated in St. Louis, Mo., for $50,000 by A. F. McArthur, F. C. Hitchcock and Wm. G. Sloan.

John Stabile will establish an ornamental stone and cement products plant in Coral Gables, Fla., to cost about $10,000.

Concrete Products Co., Elk River, Minn., is reported to put in a factory in Devils Lake, N. D.

The Hibbing Cement Construction Co. has been incorporated in Hibbing, Minn., with a capital of $50,000 by J. A. Flower, Adolph Sanoglia and others.

The Merritt Concrete Products Co., 727 Chapman street, San Jose, Calif., is contemplating the erection of a new plant on the Monterey road, estimated to cost $50,000, with machinery.

The Buckeye Tile Co., Chillicothe, Ohio, is building an addition, 100x195 ft., in which a complete machine shop will be installed. It will also install some material handling equipment as well as machinery for making tile. E. J. Hydell is general manager.

The La Mar Pipe and Tile Co., Grand Rapids, Mich., recently organized with a capital of $200,000, will build a new plant on the property of the Grand Rapids Gravel Co., La Mar, for the manufacture of cement tile, pipe, etc. It will cost about $80,000 with machinery. N. H. Battjes is president and J. Kent Wilson, general manager.

The Cast Stone Co., Columbus, Ohio, has doubled its plant capacity to take care of its increased business.

The Genesee Sand and Gravel Corp., near Bowmanville, N. Y., is erecting a concrete products plant to manufacture building tile.

The California Tylite Co., Inc., Glendale, Calif., has work in progress on the first unit of a new plant near the junction of San Fernando road and Vine street to be equipped for the manufacture of concrete tile products under a special process. It will have an initial daily output of 30,000 tiles. Frank H. Boettcher is president, and Charles H. Davies, vice-president and general manager.

The Cunard-Lang Concrete Co., Columbus, Ohio, is erecting a 350-ton stone tipple for the new automatic block machine recently installed, which will increase the daily output from 2200 to 5300 blocks per day.

Gypsum

The Imperial Gypsum Co., Imperial County, California, is building a 25-mile narrow gage road to its properties. A daily production of 200 tons will be shipped.

Dealers

The Louisville Building Supply Co., Louisville, Ky., has increased its capital stock from $30,000 to $150,000.

The Bishop-Grassan Co., Inc., has been chartered in Detroit, Mich., for $30,000 to deal in building supplies, by W. Grassan, J. L. Bishop, Rose Miller.

L. T. Mentz & Co. has incorporated in the building supply business in Detroit, Mich. Incorporators: L. T. Mentz, O. F. Senn, W. S. Heck.

The Mastenbrook-Grove-Cartier Co. has been incorporated in Grand Rapids, Mich., for $25,000 to handle building material, by P. A. Mastenbrook, P. Grove, C. E. Cartier.

The El Paso Building Material Co. has been incorporated in El Paso, Texas, for $15,000 by C. L. North, C. Harvey, J. Conner.

The Mead Material and Supply Co. has been organized in Tulsa, Okla., for $225,000 by E. W. Mead, W. M. Fleetwood, Tulsa; J. J. Harmon, Muskogee.

The Long-Bell Lumber Co., Longview, Wash., is installing a gravel washing plant at its gravel pit west of Longview with a daily capacity of 1500 yd.

The Stacey Bros. Co., Columbia, S. C., has been incorporated for $60,000 to deal in all kinds of building materials. N. E. Stacy, North Augusta, is president.

The Construction Materials Co., Chicago, Ill., operating ships out of Grand Haven, will build more dock and terminal facilities for handling sand and gravel.

The Roth Building Supply Co., Sheboygan, Wis., is erecting a warehouse for sand, crushed rock, etc. A large unloading crane has recently been purchased for use in hoisting the material from cars to bins.

The Jones Granite Co., Vinalhaven, Maine, has been incorporated for $10,000 to deal in all kinds of granite and stone. C. S. Roberts is president.

The Welch-McGrew Cement and Building Material Co., Kansas City, Mo., has filed articles of incorporation. It will specialize in cement and handle all kinds of building materials. C. J. Welch and others are incorporators.

The Dealers Granite Corp. has been formed in Llano, Texas, for $75,000 by Welhausen, G. Faubion and L. H. Baldwin.

Manufacturers

The Pennsylvania Crusher Co., Philadelphia, Pa., in order to provide more adequate facilities for their increasing volume of business in the Pittsburgh district, has recently moved its offices from the Peoples Bank building to more adequate quarters in the Oliver building, where operations will be continued under the experienced management of H. M. Hallett as district manager. The business of the Pittsburgh office is largely concerned with "Pennsylvania" coal preparation machinery for mines, byproduct coke plants, central stations and industrial power plants and with heavy duty primary and secondary crushers for large cement and lime plants.

The Link-Belt Co., Chicago and Philadelphia, announces that L. M. Dalton has succeeded E. J. Burnell as manager of the Boston branch office. Mr. Burnell resigned his post to enter business for himself and he carries with him the best

wishes of the company and those of his business associates and friends. The Cleveland office of the company has changed from Room 429 to No. 329 Rockefeller building.

Personal

F. T. Brown, district manager of the Lehigh Portland Cement Co. in Spokane, Wash., has been transferred to a similar position with the Lehigh company at Kansas City. W. G. Berrow, member of the Spokane sales and traffic staff for six years, has been named to succeed him. Mr. Brown, who as chairman of the Inland Empire Relations Committee of the Chamber of Commerce, has been active in various civic activities in Spokane, also is a member of the board of trustees of the Spokane Rotary Club. He has been with the Lehigh company in Spokane and in the East for the last 13 years and has been district manager in Spokane since 1919.

Arthur F. King, who has been business manager of Engineering and Mining Journal-Press, New York City, has resigned and returned to the sales department of the Marion Steam Shovel Co., Marion, Ohio.

J. W. Vorhis has accepted a position as quarry superintendent of the National Lime and Stone Co., Carey, Ohio.

F. Stanley Krug, Jr., assistant chief engineer of the state highway department of Ohio, has resigned to become chief engineer for the Cincinnati Quarries Co.

George Hahn, general manager of the U. S. Gypsum Co., Port Clinton, Ia., has gone to Texas where he will have charge of building a new plant for the company.

John Ericson, consulting engineer for the city of Chicago during the last political regime, has been reappointed city engineer, succeeding Alexander Murdoch. The latter has been suspended pending the filing of charges before the civil service commission by the commissioner of public works, Col. A. A. Sprague. Mr. Ericson entered the employ of the city nearly 40 years ago as draftsman in the water department.

W. H. E. Bravender, president and general manager of the Arrowhead-Portland Cement Co., which is being erected near Devore, Calif., is one of the most widely known men in the cement business. He entered the industry in 1888. In 1894 he was manager of the Empire Portland Cement Co. at Warners, N. Y., and for eight years he operated the Hudson Cement Co., Hudson, N. Y. He has been identified with cement companies in Canada, many of which he organized and operated. He was also with the Vancouver Portland Cement Co. and in later years advisory manager for the Golden State Cement Co. at Ora Grande.

Harry F. Miller, Clarksville, Tenn., has leased the plant of the Wheeler Lime Mfg. Co., of which he was formerly superintendent.

J. H. West, Texas Portland Cement Co., Dallas, Texas, has been appointed on the committee of the car service division of the American Railway Association to have charge of matters coming under the classification of cement, as a result of a meeting of the Southwest Regional Advisory Board for a correction of the present transportation problems.

Trade Literature

"Gyratory Crushing Plants" is the title of a recently issued booklet of the Austin Mfg. Co., Chicago—Bulletin No. 30. The Austin line consists of gyratory crushers ranging in size from the No. 2 to the No. 8; elevators, screens, cars, etc., all illustrated and described in catalog No. 29. No. 30 describes the company's portable crushers mounted on trucks, the portable crusher with gravel feeding conveyor, grizzly screen and folding elevator and data on the mounted crusher. This catalog also includes the Austin portable telescope bins, revolving screen, automatic end dump car, friction drum hoist, etc.

Wire Products—The Twin City Iron and Wire Co., St. Paul, Minn., Catalog No. 13 is a 72-page book with information concerning wire gages, wire cloth and screen, and other wire products.

"Better, Faster and Cheaper" is the title of a 14-page folder recently issued by the Ingersoll-Rand Co., New York City, illustrating and describing its products in use by contractors and road builders. These subjects include portable compressors, Jackhamer rock drills, "Leyner" drill steel sharpeners, paving breakers, clay diggers, backfill rammers, Cameron pumps, "Little Tugger" hoists, pneumatic tools, chipping and calking hammers, oil and gas engines, etc.

Riverside Cement Co. Purchases the Golden State Co.

IN an effort to keep pace with building activity in southern California, officials of the Riverside Portland Cement Co., Los Angeles, Calif., announce that they have purchased the holdings of the Golden State Portland Cement Co. at Oro Grande near Victorville. The deal, including cost of improvements to be made, is said to involve close to $2,000,000.

The purchase of the Golden State plant makes the Riverside company the largest concern of its kind west of the Mississippi river. The combined capacity of the various plants of the corporation is approximately 10,000 bbl. a day.

At present the capacity of the Oro Grande plant is about 1200 bbl. This, however, will be immediately increased to approximately 3600 bbl.

The Riverside Portland Cement Co. produces its own fuel oil. The concern has extensive holdings in the Montebello fields.

Increased Demand for Concrete Brick and Tile

THAT the present brick shortage should present no great difficulty to the building trades, is the opinion of J. W. Johnston, a well-known New York construction authority, for "building projects in this district are proceeding as rapidly as ever by making more use of concrete products. There are manufactured each day in the metropolitan district enough concrete products to replace over 3,000,000 brick. This provides a constant source of supply.

"New equipment is being constantly utilized to bring production to an even higher level, necessary to meet this unprecedented demand. Bricklayers lay an average of 600 concrete tile a day per man, equal in space to 3000 brick. This is twice the amount of wall laid with common brick; in using concrete block construction the ratio is greater, as one block replaces 13 brick.

"This use of concrete building units should be a stimulant to the building industry as it tends to increase competition, and this naturally means an eventual lowering of building costs in both commercial construction and home-building. Architects are now recommending concrete units with cement stucco in place of the more expensive face brick. Especially so since the recent Columbia University report was published, showing the superiority of concrete over other types of masonry construction.

"I firmly believe that if specifications are drawn to permit competitive bidding between concrete brick and building units now in common use, especially where construction work is being delayed owing to shortage of face brick, it will aid greatly in alleviating the present situation, and that by a more extensive use of this newly recognized product a means to quicker, permanent and more economical construction will be found."

Chemical Exposition Plans a "Buying Fair"

AT a meeting of the advisory committee of the Ninth National Exposition of Chemical Industries, held June 6 at the Chemists' Club, New York, the plan to make the exposition at the Grand Central Palace, New York, during September 17-22, a huge chemical "buying fair" was placed before the committee.

The plan as outlined suggested that each exhibitor display his goods in some degree that will demonstrate their particular characteristics, special uses, and selling points. It was also suggested that exhibitors arrange to have their sales forces at the exposition so that they might not only attend company sales conferences but also those sales conferences composed of the sales staffs of all the exhibitors. With the large number of chemical and chemical equipment consumers who attend the exposition each year, this sales contact on a large scale was pointed out as very desirable.

Slate Men Watch Credits and Collections

INSIST on prompt payment of accounts, is the warning conveyed in the last bulletin of the National Slate Association. Keep your assets as liquid as possible and avoid accumulating stocks at high cost, warns Bulletin No. 6 of the National Slate Association. During these goods times try to develop and study new uses for slate which can create some demand even in less active seasons. Build up your reservoir of slate work to draw on when needed to stabilize slate sales. Urge re-roofing projects when possible to postpone slating until new building is not quite so active.

Don't extend doubtful credit. A conservative price policy will make for better business and in the future surer profits than can result from a sudden rise and fall thereafter. In facing the problem before the building industry, W. F. Barney, a New York contractor said recently at a meeting:

"There is another way to face conditions like these—by co-operation, by intelligent planning of all concerned, and more specially in the bonds of mutual confidence so that what is the interest of one is the interest of all."

KOEHRING

Capacity!

No. 1 **Capacity:** 7 tons at 12 ft. radius. Will handle bucket up to and including one cubic yard capacity, the radius of operation depending upon the size of the bucket. Standard boom 35 ft. long, but special lengths of boom can be furnished where necessary. Four cylinder 5" x 6" gasoline engine.

No. 2 **Capacity:** 12 tons at 12 ft. radius. Will handle bucket up to and including 1½ cubic yards capacity, the radius of operation depending upon the size of the bucket. Standard boom 40 ft. long, but special lengths of boom can be furnished where necessary. Four cylinder 7½" x 9" gasoline engine.

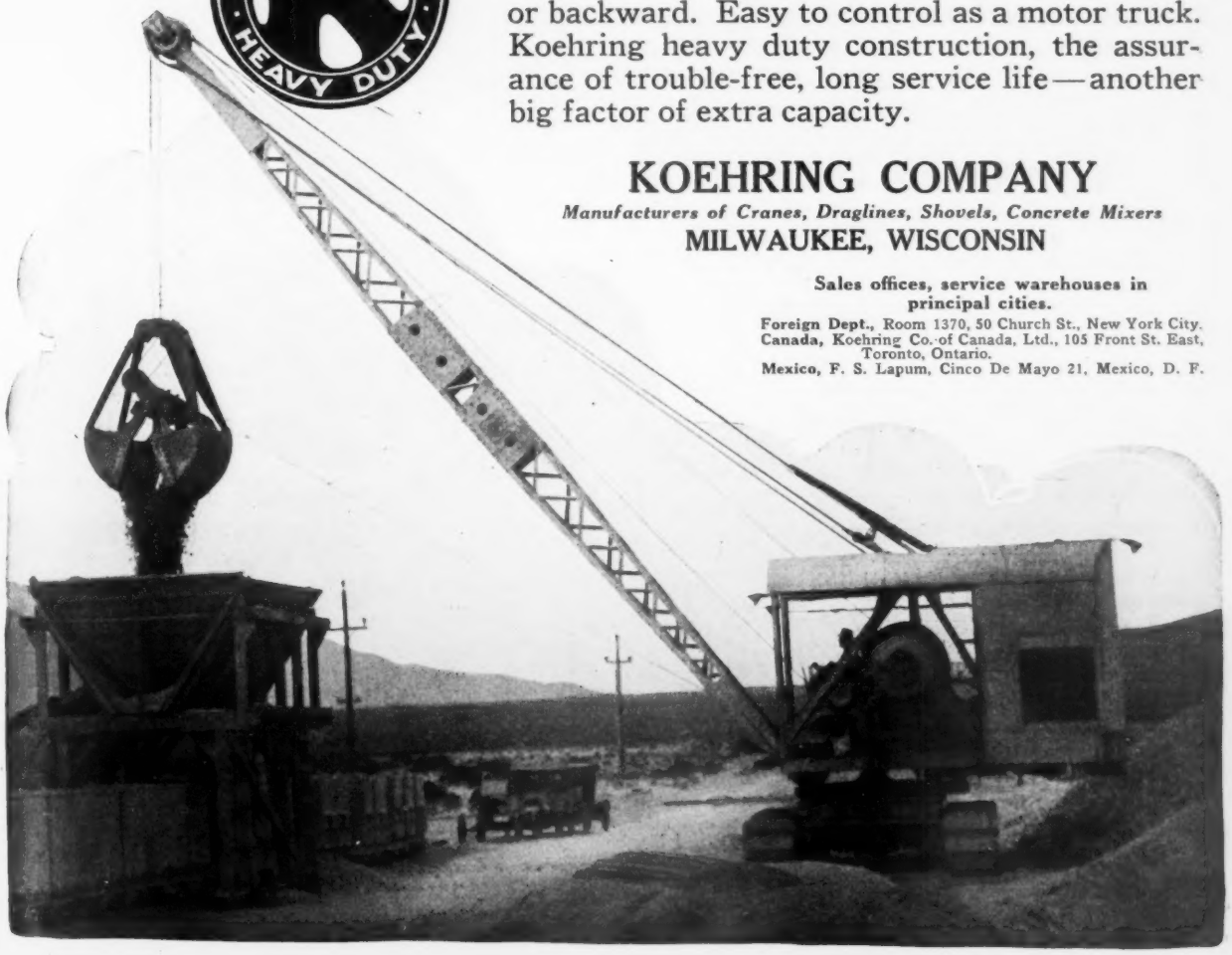
No. 3 **Capacity:** 20 tons at 12 ft. radius. Will handle bucket up to and including 2 cubic yards capacity, the radius of operation depending upon the size of bucket. Standard boom 40 ft. long, but special lengths of boom can be furnished where necessary. Four cylinder 8½"x10" gasoline engine.

CAPACITY, the profit factor, is measured not alone by bucket dimensions, by line-speed and power, but is greatly increased or decreased by flexibility of operation, speed and ease of control, and ability to stand up to unsparing high speed operation without breakdown delays, or fast depreciation.

Boom with load. The Koehring alone is designed to combine the functions of elevating, or lowering boom, and of swinging boom simultaneously. No excessive wear. This new flexibility means excess capacity. *Single lever* steering turns crane to right or left, propels it forward or backward. Easy to control as a motor truck. Koehring heavy duty construction, the assurance of trouble-free, long service life—another big factor of extra capacity.

Reg. U. S. Pat. Off.

KOEHRING · HEAVY DUTY



KOEHRING COMPANY

Manufacturers of Cranes, Draglines, Shovels, Concrete Mixers

MILWAUKEE, WISCONSIN

Sales offices, service warehouses in principal cities.

Foreign Dept., Room 1370, 50 Church St., New York City.
Canada, Koehring Co. of Canada, Ltd., 105 Front St. East, Toronto, Ontario.
Mexico, F. S. Lapum, Cinco De Mayo 21, Mexico, D. F.

Buyers' Directory
of the Rock Products Industry

Classified Directory of Advertisers in this issue of Rock Products

AERIAL TRAMWAYS
Interstate Equip. Co., New York, N. Y.

AIR COMPRESSORS
Worthington Pump & Mach. Corp., New York City, N. N.

AUTOMATIC WEIGHERS
Richardson Scale Co., Passaic, N. J.
Schaffer Eng. & Equipment Co., Pittsburgh, Pa.

BABBITT METAL
Ajax Metal Co., Philadelphia, Pa.

BAGS AND BAG MACHINERY
Jaite Co., The, Jaite, Ohio

BELTING
Robins Conveying Belt Co., New York City, N. Y.

BINS
Austin Mfg. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Hendrick Mfg. Co., Carbondale, Pa.
Weller Mfg. Co., Chicago, Ill. (storage).

BELT FASTENERS
Crescent Belt Fastener Co., New York City, N. Y.

BIN GATES
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Weller Mfg. Co., Chicago, Ill.

BRICK MACHINERY
Shope Brick Co., Portland, Ore.

BUCKETS—Elevator
American Manganese Steel Co., Chicago Heights, Ill.
Austin Mfg. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.

BUCKETS, GRAB
Brown Hoisting Machinery Co., Cleveland, Ohio.
McMyler Interstate Co., Cleveland, Ohio.

CABLEWAYS
Interstate Equip Co., New York, N. Y.
Link-Belt Co., Chicago, Ill.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.

CARS—Quarry and Industrial
Atlas Car & Mfg. Co., Cleveland, Ohio.

CAR PULLERS
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

CASTINGS
McGann Mfg. Co., Inc., York, Pa.

CEMENT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.

CHAIN
Carroll Chain Co., Columbus, Ohio.
Link-Belt Co., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

CLAMPS
Knox Mfg. Co., Philadelphia, Pa.

CLUTCHES
Dodge Mfg. Co., Mishawaka, Ind.
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

CONVEYORS AND ELEVATORS
Austin Mfg. Co., Chicago, Ill.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Robins Conveying Belt Co., New York City.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.

COUPLINGS
Knox Mfg. Co., Philadelphia, Pa.

CRANES—Crawler
Industrial Works, Bay City, Mich.
Link-Belt Co., Chicago, Ill.

CRANES—Locomotive
Byers Machine Co., Ravenna, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Koehring Co., Milwaukee, Wis.
Link-Belt Co., Chicago, Ill.
McMyler-Interstate Co., Cleveland, Ohio.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., The, Marion, Ohio.
Northwest Engineering Co., Chicago, Ill.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulverizer Co., St. Louis, Mo.
Austin Mfg. Co., Chicago, Ill.
Austin-Western Road Mach. Co., Chicago, Ill.
Buchanan Co., Inc., C. G., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.
Fuller-Lehigh Co., Fullerton, Pa.
Good Roads Machinery Co., Kennett Square, Pa.
K. B. Pulverizer Co., New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Morgan Engineering Co., Alliance, Ohio.
Munson Mill Machinery Co., Utica, N. Y.
New Holland Machine Co., New Holland, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Webb City and Carterville Fdy. and Mach. Co., Webb City, Mo.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.
Worthington Pump & Mach. Corp., New York City, N. N.

CRUSHER REPAIRS—Manganese Steel
American Manganese Steel Co., Chicago Heights, Ill.

DERRICKS
American Hoist & Derrick Co., St. Paul, Minn.

DIPPER TEETH
American Manganese Steel Co., Chicago Heights, Ill.

DREDGING MACHINERY
Ellicott Machine Co., Baltimore, Md.

DRILLS
Sanderson Cyclone Drill Co., Orrville Ohio.

DRILLERS
Pennsylvania Drilling Co., Pittsburgh, Pa.

DRYERS
American Process Co., New York City.
Buckeye Dryer Co., The, Chicago, Ill.
Fuller-Lehigh Co., Fullerton, Pa.
Lewistown Fdy. and Mach. Co., Lewistown, Pa.
McGann Mfg. Co., Inc., York, Pa.
Ruggles-Coles Eng. Co., New York, N. Y.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

DUST COLLECTING SYSTEMS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

ENGINES—Steam
Morris Mach. Works, Baldwinsville, N. Y.

ENGINEERS
Buckbee Co., J. C., Chicago, Ill.
Hunt, R. W., & Co., Chicago, Ill.
Richard K. Meade & Co., Baltimore, Md.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

EXCAVATORS—Dragline Cableway
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

EXPLOSIVES
Hercules Powder Co., Wilmington, Del.

FROGS AND SWITCHES
Central Frog & Switch Co., Cincinnati, Ohio.

GAS PRODUCERS
Morgan Construction Co., Worcester, Mass.
R. D. Wood & Co., Philadelphia, Pa.

GEARS
Dodge Mfg. Co., Mishawaka, Ind.
Link-Belt Co., Chicago, Ill.

GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa

Buyers' Directory
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Classified Directory of Advertisers in this issue of Rock Products

GRINDING MILLS
Munson Mill Machinery Co., Utica, N. Y.

GRIZZLIES
Robins Conveying Belt Co., New York City.

HOISTS
American Hoist & Derrick Co., St. Paul, Minn.
Austin Mfg. Co., Chicago, Ill.
Hyman-Michaels Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

HOSE APPLIANCES
Knox Mfg. Co., Philadelphia, Pa.

HYDRATING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio
Kritzer Co., The, Chicago, Ill.
Meade & Co., Richard K., Baltimore, Md.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Toepfer & Sons Co., W., Milwaukee, Wis.

HYDRAULIC DREDGES
Morris Machine Works, Baldwinsville, N. Y.

INSULATION
Celite Products Co., Chicago, Ill.

LIME HANDLING EQUIPMENT
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

LIME KILNS
McGann Mfg. Co., Inc., York, Pa.
Meade & Co., Richard K., Baltimore, Md.
Vulcan Iron Works, Wilkes-Barre, Pa.
Worthington Pump & Mach. Corp., New York City, N. N.

LIQUID FUEL EQUIPMENT
W. N. Best Furnace & Burner Corp., New York, N. Y.

LOADERS AND UNLOADERS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Link-Belt Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Davenport Locomotive Works, Davenport, Iowa.
Fate-Root-Heath Co., Plymouth, Ohio.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Ironton Engine Co., Ironton, Ohio.
Lima Locomotive Works, New York, N. Y.
Milwaukee Locomotive Mfg. Co., Milwaukee, Wis.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

MANGANESE STEEL
Hadfield-Penfield Steel Co., Bucyrus, Ohio

MILLS (Grinding, Etc.)
Fuller-Lehigh Co., Fullerton, Pa.
Kent Mill Co., Brooklyn, N. Y.
Munson Mill Mach. Co., Utica, N. Y.
Sturtevant Mill Co., Boston, Mass.

PAINT AND COATINGS
Williams, C. K., & Co., Eaton, Pa.

PERFORATED METALS
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.

PORTABLE CONVEYORS
Austin Mfg. Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
Emerson Pump and Valve Co., Alexandria, Va.
Morris Machine Works, Baldwinsville, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Worthington Pump & Mach. Corp., New York City, N. N.

PULLEYS
Dodge Mfg. Co., Mishawaka, Ind.
Weller Mfg. Co., Chicago, Ill.

PULVERIZED FUEL EQUIPMENT
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

QUARRY EQUIPMENT
Universal Road Mach. Co., Kingston, N. Y.

ROAD MACHINERY
Austin-Western Road Mach. Co., Chicago, Ill.

ROPE, WIRE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

SAND SETTLING TANKS
Good Roads Machinery Co., Kennett Square, Pa.

SCALES
Richardson Scale Co., Passaic, N. J.

SCRAPERS, DRAG
Austin-Western Road Machinery Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

SCREENS
Austin Mfg. Co., Chicago, Ill.
Austin-Western Road Mach. Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.
Lewistown Fdy. and Mach. Co., Lewistown, Pa.
Link-Belt Co., Chicago, Ill.
New Holland Machine Co., New Holland, Pa.
Robins Conveying Belt Co., New York City, N. Y.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
W. Toepfer & Sons Co., Milwaukee, Wis.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Twin City Iron & Wire Co., St. Paul, Minn.
Tyler Co., The, W. S., Cleveland, Ohio.
Universal Road Mach. Co., Kingston, N. Y.
Weller Mfg. Co., Chicago, Ill.

SEPARATORS
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Tyler Co., The W. S., Cleveland, Ohio.

SEPARATORS, MAGNETIC
Buchanan Co., C. G., Inc., New York, N. Y.

SHEAVES
Dodge Mfg. Co., Mishawaka, Ind.
Weller Mfg. Co., Chicago, Ill.

SHOVELS—Steam, Electric and Gas
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Hoar Shovel Co., Duluth, Minn.
Northwest Engineering Co., Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., The, Marion, Ohio.

SPROCKETS AND CHAIN
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

STEEL PLATE CONSTRUCTION
Hendrick Mfg. Co., Carbondale, Pa.

STORAGE BINS
Austin Mfg. Co., Chicago, Ill.
Austin-Western Road Mach. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.

TANKS, STEEL STORAGE
Traylor Eng. & Mfg. Co., Allentown, Pa.

TESTING SIEVES AND SHAKERS
Tyler Co., The W. S., Cleveland, Ohio

TRACK EQUIPMENT
Central Frog & Switch Co., Cincinnati, Ohio.

TRAMWAYS
Interstate Equip. Co., New York, N. Y.

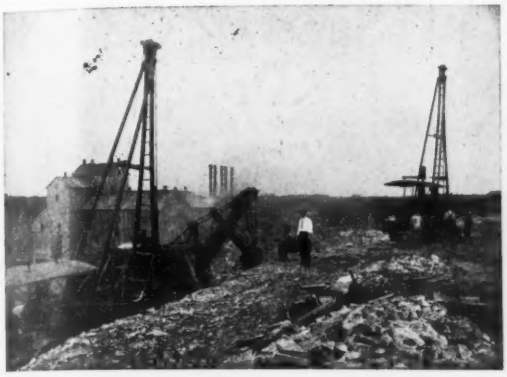
TRANSMISSION MACHINERY
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

VALVES
Knox Mfg. Co., Philadelphia, Pa.

WASHERS, SAND AND GRAVEL
Lewistown Fdy. and Mach. Co., Lewistown, Pa.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.

WIRE ROPE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

WIRE CLOTH
Cleveland Wire Cloth Co., Cleveland, Ohio.
Twin City Iron & Wire Co., St. Paul, Minn.
Tyler Co., The W. S., Cleveland, Ohio.



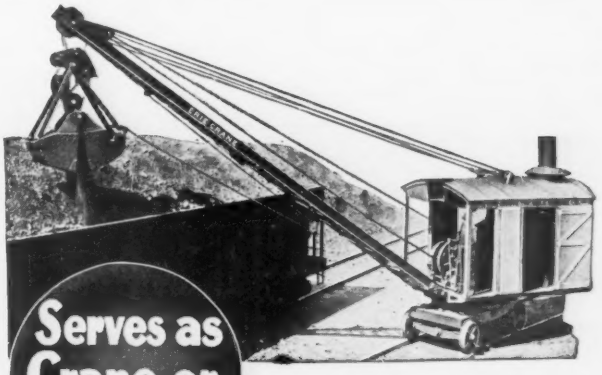
Flirting With the Shovels

In the game of crushed stone quarrying a drill that is within flirting distance with steam shovel or the loading gangs is in a dangerous position. A breakdown on the drill, and the whole production schedule is upset.

No. 14 Cyclone Drills, on the job, always keep plenty of stone ahead, and if they should ever be crowded there is no need for worry—the working parts are cast steel, reducing to the very minimum all possibility of breakdowns.

Write for "Big Blast Hole Drills," a semi-technical treatise on quarry drilling and also containing a complete description of Cyclone No. 14 Big Blast Hole Drills.

The Sanderson-Cyclone Drill Co.
Orrville, Ohio
Eastern and Export Office: 30 Church Street, New York City



Serves as Crane or Steam Shovel

Every ERIE can be quickly and easily changed over to a Locomotive Crane. Gives excellent service with clamshell bucket — excavates gravel, loads cars, handles storage, etc.

In the hardest steam shovel service, gravel producers and quarrymen have found the ERIE very sturdy and reliable.

"Our first ERIE has been digging hard gravel for 3 years without any repairs. We have in the past operated other steam shovels that are good, but the ERIE is the best, being by far the most substantial." Write the Standard Builders' Supply Co., Grand Rapids, Mich. They own 2 ERIES, a Steam Shovel and a Crane.

Write for Bulletin P-16, showing just what you can do with the ERIE, both as crane and steam shovel.

ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.
Builders of ERIE Steam Shovels and Locomotive Cranes

ERIE Revolving Shovels

OSGOOD 29-1 yd. working in close quarters.

You can depend on Osgoods

Osgood Steam Shovels—in Design, Construction and Performance are reliable—just the machine to keep up production. Great mobility, easy operation and wide range of adaptation make them worth having.

Descriptive Bulletins on Request
¾ and 1 yd. Revolving type
1½ to 6 yd. Railroad type

The OSGOOD Company
MARION, OHIO, U. S. A.

12 Ton Type E Gasoline Operated Crawling Tread Dragline Crane

Greater Production—Less Cost

You can always be assured of greater production at less cost when your plant is equipped with an O-S Dependable Crane, because it delivers speed, capacity, and service to an unusual degree.

These machines can be equipped with various devices for handling material.

Write for our catalog No. 24. It is fully illustrated with the O-S on the job.

ORTON & STEINBRENNER CO.
Main Offices—Chicago, Ill.
Factory—Huntington, Ind.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Type ads only. No cuts or illustrations permitted unless at the regular display advertising rates. Please send check with order. These ads must be paid for in advance of insertion

IMMEDIATE SHIPMENT

Sturtevant Crushers as follows:
Jaw; 12x26 in.; 6x20 in.; 2x6 in.
Rock Emery, vertical 30 and 36 in.
Roll 36x16 in.; 20x14 in.; 8x5 in.
Rotary Fine; No. 00, 1, 2, and 3.
Ring Roll; No. 1, 2, 2 Duplex.
Hardinge 4½ ft. and 3 ft. Ball Mills.
Hardinge 8 ft. x 22 in. Pebble Mills.
Telsmith No. 5 Intermediate Breaker.
Gyratories; Nos. 3, 5, 6, 7½, and 8.
Tube mills; 5x22 ft. and 6x16 ft.
Direct Heat Rotary Dryers; 3½x30 ft., 4x30 ft., 5½x50 ft., 6x40 ft. and others.
Vulcan 6x120 ft. Rotary Kilns.
Ruggles-Coles and Christie Rotary Dryers.
Raymond Kent and Fuller Mills.
Swing Hammer Mills, all makes.
Crushers of all sizes and types.

High Grade New and Used Machinery for the Entire Rock Products and Non-Metallic Mineral Industry Our Specialty

American Machinery Equipment Co., Charlotte, North Carolina

SPECIAL BARGAINS

Send Us Your Boiler Inquiries

66x86 in. TRAYLOR JAW CRUSHING PLANT.
25-50-80-110 HP. Elec. Hoists.
Nos. 4-5-6-7½-9 and 10 CRUSHERS.
6 and 10 ton Gasoline Locomotives.
2-DISC CRUSHERS, 24, 28 and 36 in.
100 TON 2½ yd. ELECTRIC SHOVEL.
50-5000 ft. Steam Belt and Electric Compressors.
13x30 in.; 10x18 in.; 8x14 in. JAW CRUSHERS.
24x54 MC LANAHAN ROLL CRUSHERS.
50 HP. D. D. HOIST, 440 V. 3 Ph. Motor Dragline Set; Also 25 HP. Dragline Equip.
New G. E. Gas Engine Sets, 5-25-kw. 125-250-V.
3 60-HP. GASOLENE S-D HOISTS, PRAC. NEW.
10 and 12 ton ROAD ROLLERS.
5-7½ and 10 HP. PORTABLE CONVEYORS.
750-1000 GPM. UNDERWRITERS STEAM PUMPS.
NEW No. 5 GYRATORY CRUSHER (MICHIGAN)

Send Us Your Inquiries for Your Wants

ROSS POWER EQUIP. COMPANY
Indianapolis, Ind.

FOR SALE

Marion Model 92 Railway-Type Steam Shovel with 5-yd. dipper. Machine is positively as good as new. Is three years old but was only used in handling 200,000 yds. soft material.

A Real Buy

F. MAYER
737 Monadnock Block Chicago

- 1—50-ton standard gauge Brooks 6-wheel switcher.
- 1—28-ton standard gauge Shay geared locomotive.
- 2—10x16" 36" gauge 4-wheel saddle tank locomotives.
- 2—9x14" 36" gauge 4-wheel saddle tank locomotives.
- 1—14-B Bucyrus steam shovel, mounted on traction wheels.
- 2—18-ton O&S bucket handling locomotive cranes.
- 10 Miles 30-lb. and 35-lb. relay steel rails, Natalbany, La.

Birmingham Rail and Locomotive Co.
Birmingham, Ala.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½x25', 4x30', 5½x50', 6x60' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 4x40', 5x50' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 5x4', 3x3½' pebble and ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; 4½x20', 5x11', 5x20', 5½x22' and 6x20' tube mills; 7½x13", 9x15", 16x10" and 12x26" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24", 36" and 40" cage mills; 3' and 4½', 6' and 8' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8', 6x5' and 4x3' Newaygo vibrating screens; Richardson automatic scales; 8' and 10' Emerick air separators.

Air compressors.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

ROTARY DRYERS

30 New Direct Fired Rotary Dryers
4 ft. 0 in. diameter, 30 ft. long

These Dryers were about to be put into operation as the Armistice was signed, and consequently were never used. We are offering them at a sacrifice, complete with driving mechanism, furnace irons, grates, etc. Some are equipped with steam radiators for steam heated air drying.

McDERMOTT BROS CO.
Allentown, Penna.

FOR SALE

- 1—6K Gates Crusher.
- 1—4B Gates Crusher.
- 15—4½-5 ton steel body, end dump, heavy duty, Standard gauge quarry cars.
- 2—Locomotives.
- 1—70 ton Steam Shovel, 2½ yard bucket.

All in good working order.
Will sell at very low price.

Inland Crushed Stone Co.
105 North Clark St. Chicago, Ill.

FOR SALE

No. 5 Gates Gyratory Style D Crusher.
No. 6 Gates Gyratory Style D Crusher.
Two Climax No. 2—9x16-in. Jaw Crushers.
70 H. P.—13x16-in. Erie City Steam Engine.
22x48-in. Hardie Tynes Corliss Steam Engine, complete.
Two G. E., 150 H. P. Motors, Voltage 220-240.
Worthington Steam Pump, 10x8-in.; 20-in. cylinders.
Two No. 0 Thew ⅝-yard bucket steam shovels mounted Standard Railroad Trucks.
Sanderson Cyclone No. 14 Well Drill, complete.

E. W. COOPER
174 Third Ave. N., Nashville, Tenn.

Take advantage of the Opportunity offered in the Used Equipment Department to dispose of the equipment that you no longer need.

WANTED

Good Gates No. 3 Crusher.

Island Sand & Gravel Co.
Columbus, Ohio

FOR SALE

1—4½'x30' American Process Dryer.
1—10½" x 12" Brown, Double Drum Steam Hoist.

Consolidated Products Co.
15 Park Row, New York City

FOR SALE

5 5x6x7x110′ Rotary KILNS.
5 5x21′ Tube Mills (1 has Silax Lining, 3 Steel Lining, 1 without Lining).
2 No. 8 Ball Mills.
1 4x40′ Coal Dryer.
1 No. 6 Gates Crusher.
2 5½x22′ Smidth Tube Mills.
2 No. 66 Smidth Kominuters.
2 6x60′ Rotary Dryers.
1 Lathe, 26″ Swing, 16′ Bed.
2 Automatic Weighing Machines.
3 Roll Leather Belting, 3-ply, 46″x 242′. And lot of Miscellaneous Equipment.

ENGINEERING SALES COMPANY
Stockertown, Pa.

For Sale—STEAM SHOVEL
⅝ YD. THEW "O" TRACTION

Thoroughly rebuilt; attractive terms for quick sale.

Walter A. Zelnicker Supply Co., St. Louis
Rails, Locomotives, Cars, Tanks, Pipe

For Sale By Receiver:

3 Derricks complete with guy ropes, and 2 Channelling Machines—complete equipment for manufacturing grindstones. Also Grindstone Quarry.

FRED W. KINDE
Bad Axe, Michigan

FOR SALE

One 14x18 Erie Automatic Tangy Engine, one heater and 50 ft. of 4½″ piping.

The North Indiana Brick Co.
Michigan City, Indiana

Mine Cars, Rails and Locomotives

We have a number of good, serviceable, standard gauge, second hand locomotives, and narrow gauged ones, for immediate shipment.

M. K. FRANK
Frick Building Pittsburgh, Pa.

1—10x13 3-Drum Hoisting Engine
1—9x10 3-Drum Hoisting Engine
1—9x10 Dbl. Drum Hoisting Engine
4—7x10 Dbl. Drum Hoisting Eng.
4—5½x8 Dbl. Drum Hoisting Eng.
1—75; 1—40; 1—25 H. P., D. D. Electric Hoists.
3—Dake Swingers.
4—Holding Drums
3—Two Bag Rex Steam Concrete Mixers
9—D. C. S. D., Reversible Builder's Hoists
2—325′; 1—400′; and 2—900′ Ingersoll Rand Belt Driven Air Compressors
3—10 x 10 x 10 Steam Driven Air Compressors.
1—80′ All Steel Stiff Leg Derrick.
1—60′ All Wooden Stiff Leg Derrick

We buy, sell, or rent
Mertes Machinery Company
Milwaukee, Wisconsin

FOR SALE

75 hp. 2 speed Thomas electric dragline hoist. Good as new.

No. 5 and No. 2 Allis Chalmers gyratories. Good shape.

Island Sand & Gravel Co.
Columbus, Ohio

Classified Advertising

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POSITION WANTED

First-class executive of long experience in erection and operation of stone crushing and sand and gravel plants seeks connection as manager or superintendent taking full charge. Excellent references. Address

Box 1672, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

PLANT FOR SALE

On account of the death of owner, and to close his estate, the holdings and equipment of the American Rock Asphalt Company are offered for sale. The company controls about two thousand acres, underlaid with inexhaustible deposit of Silica Sand Asphalt, convertible into a high grade paving material, fully processed by merely crushing. Equipment adequate for economical operation. Durability and superior qualities of product established by thorough tests. Address,

CHAS. E. BAILEY, P. O. Box 336, Hugo, Oklahoma

Position Wanted

Young man with several years' experience in operation of hard stone quarries, both large and small. Able to take complete charge and to furnish good references. Available July 1st.

Address Box 1668, Care Rock Products
542 South Dearborn Street Chicago, Ill.

WANTED

Superintendent for Hard Rock Crushing Plant. Must be thoroughly competent and years of experience in getting out quantity production. State experience, references, and salary expected in first letter. Address

F. C. S., Care of Rock Products
542 South Dearborn Street Chicago, Ill.

Southern Negro Labor Supplied

Advance orders taken. Correspondence invited.

PARKER & CO.
309 East 39th Street, Chicago

WANTED

Working superintendent for a lime plant in Massachusetts. Must be a good executive and have thorough knowledge of lime burning, rock crushing and general machinery used in the business. Apply with full particulars.

Box 1670, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

FOR SALE

Complete sand and gravel plant. Present capacity four hundred tons per day. An ideal deposit, excellent in quality, deep, and forty acres in extent. Railroad and trucking deliveries. Address

Box 1671, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

Competent and Energetic Supt.

open for position. Knowledge of the business gained from actual experience in personally handling plant and quarry work in detail. Thoroughly familiar with installation, operation and maintenance of crushing and quarrying machinery and with development of plants and quarries. Can assure efficient and economical operation. Willing to locate anywhere if future prospects favorable. Address

Box 1673, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

WANTED

Superintendent for Glass Sand plant. Practical man understanding quarry and mill, with some business experience. Give age, references and salary expected in reply. Address

Box 1667, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

Superintendent

Having 16 years' experience in Sand Plant and Quarry work seeks position. References. Familiar with all details—both Mill and Quarry.

Box 1665, care Rock Products
542 South Dearborn Street, Chicago, Illinois

Position Wanted

By Cement plant superintendent with mechanical ability, construction and operating; 20 years' experience in wet and dry plants, 18 years' experience as General Foreman and Superintendent, now employed in the Lime Manufacture. Desires change. Excellent references.

Box 1669, Care of Rock Products
542 South Dearborn St. Chicago, Ill.

Have you a plant for sale? Do you wish to purchase a plant? Are you in need of a superintendent or manager? Are you looking for a position as plant superintendent or manager? Advertise your wants in these columns for quick results.

INDEX TO ADVERTISEMENTS

The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

Published Every Other Saturday by

Tradepress Publishing Corporation

542 South Dearborn Street, Chicago, Illinois

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Volume 26 June 30, 1923 Number 13

CONTENTS

One NORTHWEST *out of every three is a repeat order!*

There is no greater testimonial of satisfaction than repeat orders for NORTHWESTS from responsible concerns.

Ease of handling, power and economy of operation builds up a satisfaction that makes them think in terms of NORTHWEST.

Make your first order a NORTHWEST and there is no doubt about what your second machine will be.

Northwest Engineering Co.
1234 Steger Bldg., Chicago

NORTHWEST

CRANE
DRAGLINE
SHOVEL

GAS or ELECTRIC

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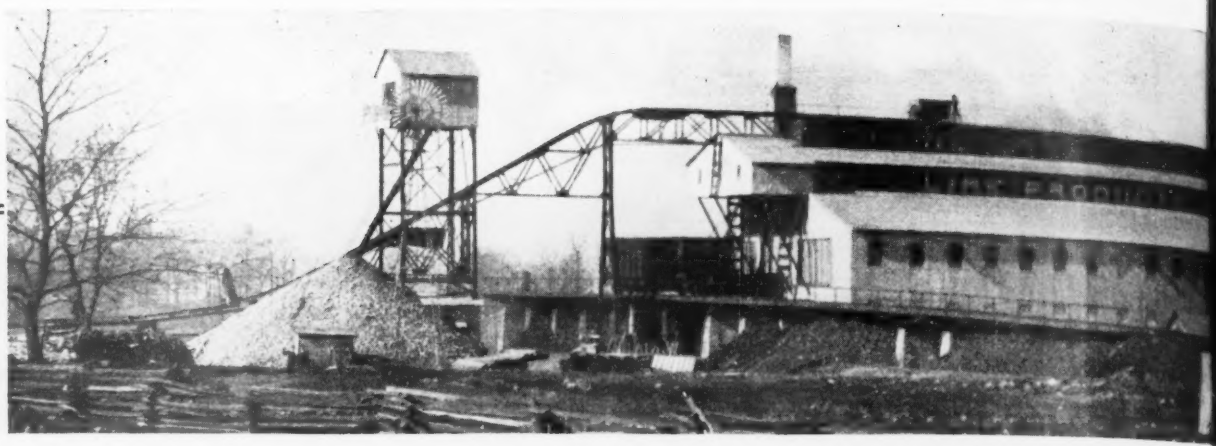


General View of Plant of (...)drate &

RAYMOND IN(...)

One of the three Raymond Pulverizers is shown to the left and back of the Schaffer Hydrator

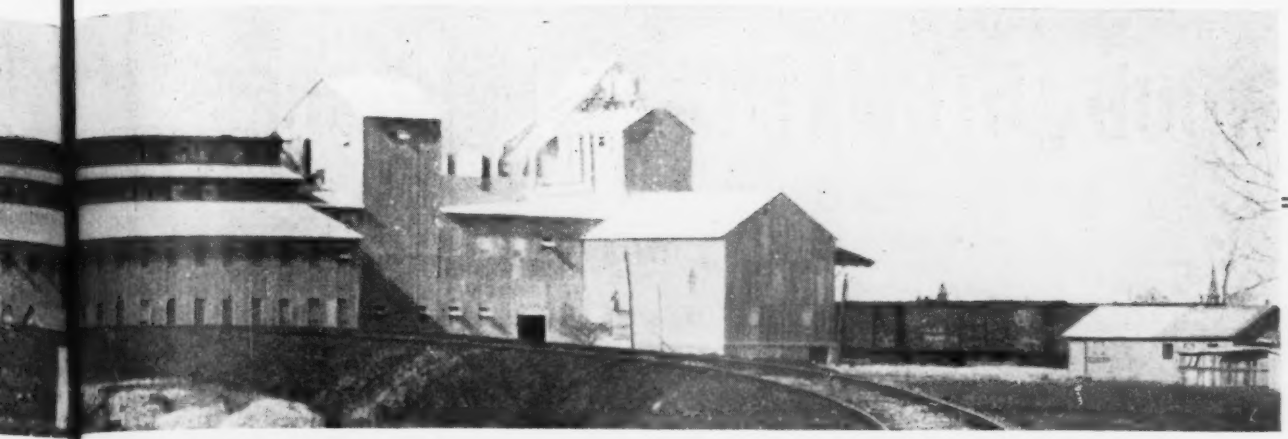
Twenty-five cents a ton is the total cost, including depreciation, interest, power, repairs and labor to the Ohio Hydrate and Supply Company, using Raymond Pulverizers, which takes their lime from the hydrator, grinds and air separates it, and delivers the finished product to the storage bin.

This concern installed the first two machines in their initial plant in 1917, and added a third during 1920. The three machines produce 14 tons per hour and operate 24 hours a day, 306 days a year.

RAYMOND B(...)S.

Eastern Office
50 Church St.
New York City

13(...)rth E



Plant of Hydrate & Supply Company

NSTALLATION

Raymond Pulverizers, equipped with Air Separation, do three things in handling the lime between the Hydrator and finished product bin.

FIRST:—They beat up the lime, distributing the moisture more evenly throughout, and tending to complete hydration.

SECOND:—This beating action separates the impurities like core, sand, and unburnt lime, eliminating them from the beater chamber through a throw-out attachment.

AND THIRD:—The ground material is classified into a fine powder and delivered direct to a storage bin without dust or the use of an elevator.

Raymond Equipment will perform the same for you, producing a finished material in the best possible condition for use in both the building and chemical industries as well as for agricultural purposes.

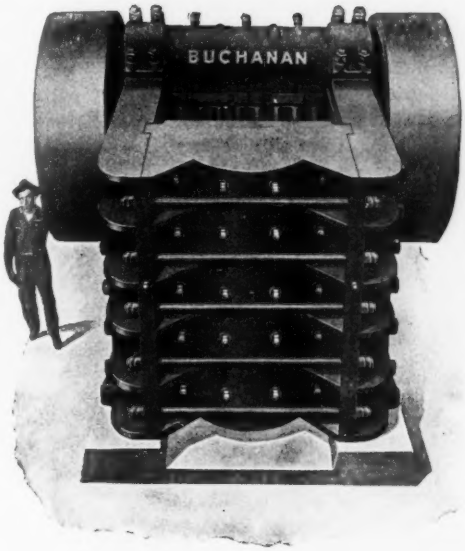
You will find the cost per ton far less than by the use of screens or any other method and you will have a superior product to market.

D B S. IMPACT PULVERIZER CO.

130rth Branch Street, Chicago

Western Office
1002 Washington Bldg.
Los Angeles

Buchanan Crushing Plant Equipment

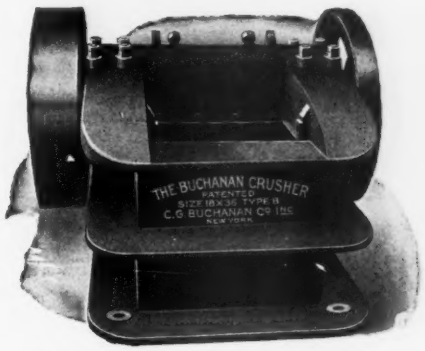


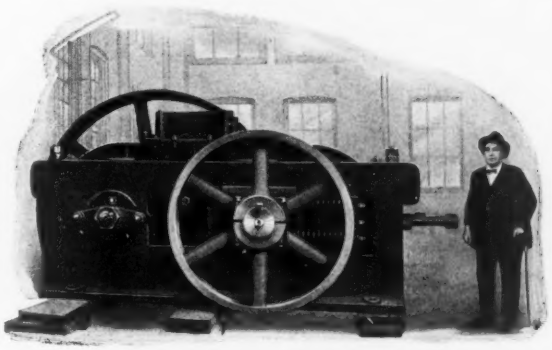
Buchanan Type C Jaw Crusher

is the ideal crusher for preliminary breaking of lime kiln stone. As it has an adjustable jaw stroke, this crusher produces a minimum of fines—a **maximum of kiln sized stone.** This fact has been thoroughly established by British experience. Two of the largest lime manufacturers of Great Britain—The Buxton Lime Firms, Ltd., and Constable, Hart & Co., Ltd.—adopted the **Buchanan Jaw Crushers** after a most thorough investigation, here and abroad.

Buchanan Type B Jaw Crushers

Are the Ideal Type for secondary crushing





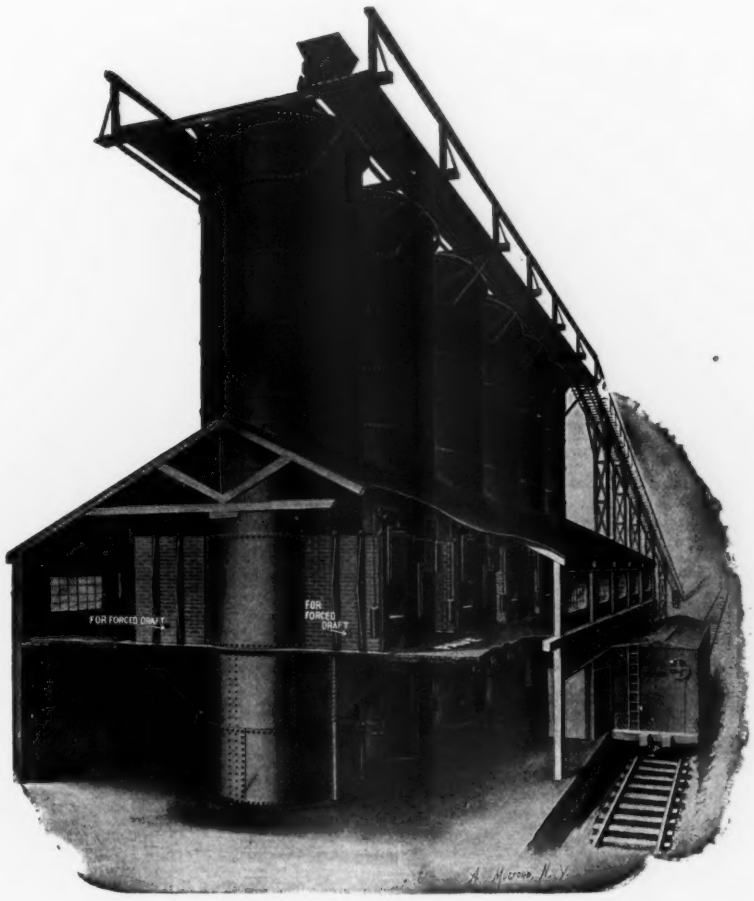
Buchanan Rolls

are the best and most economical equipment for reducing limestone to the smaller commercial sizes—for preparing feed to the pulverizers to get the maximum output from the pulverizers.

Avoid Waste Sizes and Waste Screenings
Use Buchanan Jaw Crushers Throughout

C. G. BUCHANAN COMPANY, Inc.

Cedar and West Streets **New York, N. Y.**



DO YOU USE OR SELL LIME?

The Keystone kiln is a vertical kiln developed through use in the largest plants in the country.

The lime is fed through a charging bell, preventing the escape of hot gases, thus making the operation economical in fuel consumption. The lime is discharged through a cooling cone by the use of special drawing shears, direct into cars or conveyors, thus facilitating the handling of the finished product.

The Steacy-Schmidt Manufacturing Co. manufacture both the Keystone vertical kiln and rotary lime kiln. They recommend the kiln best suited for the purpose.

Write for the Keystone Lime Kiln catalog

STEACY-SCHMIDT MANUFACTURING COMPANY
York, Penna.

Keystone Lime Kilns

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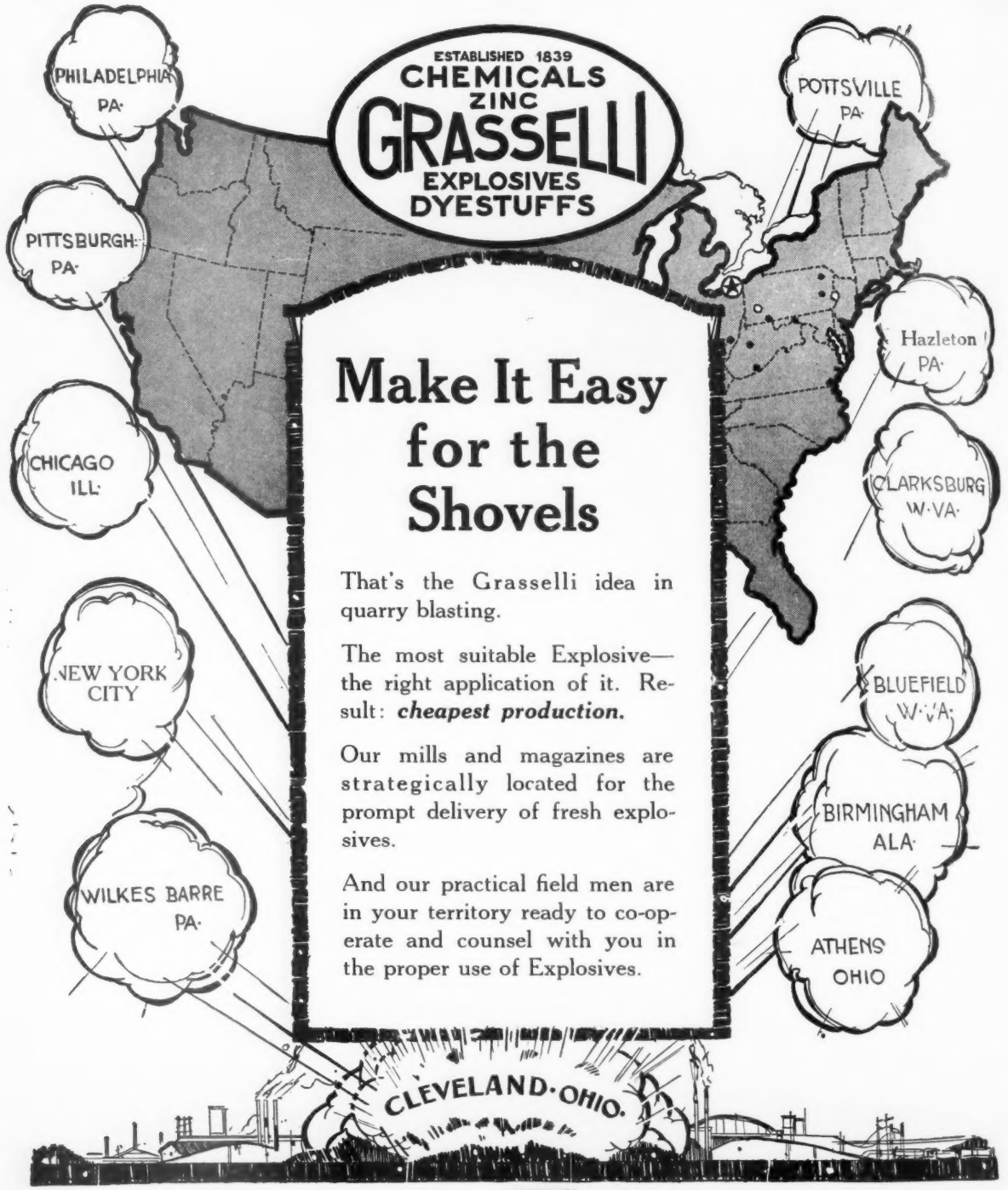

GRASSELLI EXPLOSIVES

The Grasselli Powder Company

Main Office: Cleveland, Ohio

New York Office: 117 Hudson Street

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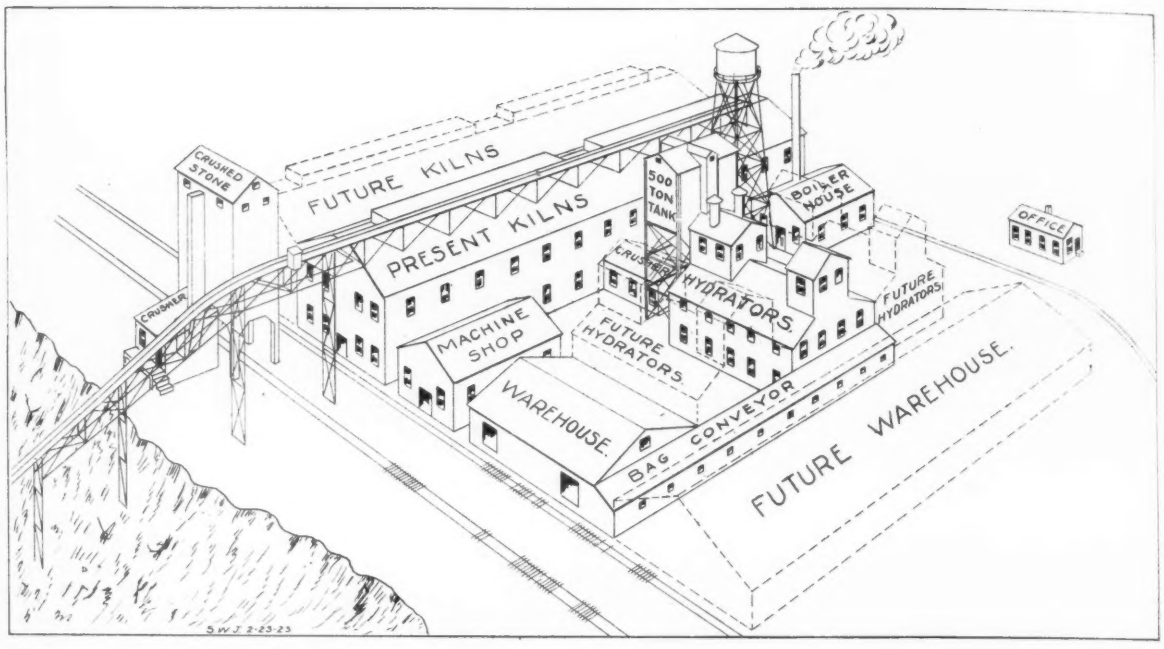
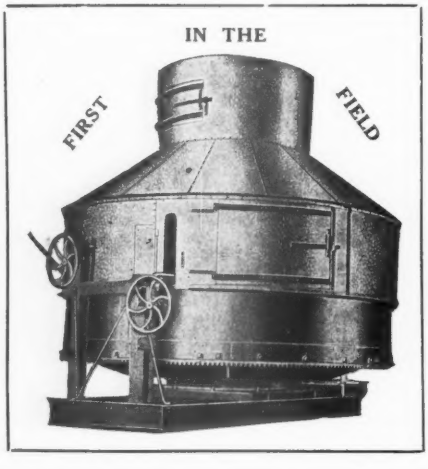


A Complete Engineering Service



This organization places a complete engineering service at your disposal—an engineering service capable of designing and building a complete lime plant or any part of it.

It is an engineering department that knows lime and how to manufacture it. It knows how to co-ordinate the parts into one complete, efficient unit that results in economical operation.

We maintain a testing laboratory and are able to give you accurate information as to whether or not your stone will burn properly and make good hydrate, and for just what purpose the hydrate is suited.

This service costs you nothing. Send us a 100 lb. sample of your stone and we will make these tests. The opinion of experts is at your disposal.

Economy, efficiency and service satisfaction has accompanied every **Clyde Hydrator** that we have installed. Fully 90 per cent of the hydrate manufactured in America is produced with the Clyde. It proves that the Clyde is a Superior Hydrator, for no article ever attained such preponderance in its favor without manifest superiorities. It is the machine built for performance.

We co-operate with you in every way. Take advantage of our experience. It costs you nothing.

H. MISCAMPBELL

Patentee and Sole Manufacturer

Patented	Serial No.
April 3, 1900	646544
Oct. 10, 1905	801329
Nov. 29, 1921	1398238

DULUTH **MINNESOTA**

Every Kind of Work

WINTER put in overtime this year, but the Lutz Stone Company, Oshkosh, Wisconsin, kept their Thew busy in spite of the ice in the pit and frost in the ground.

For one thing, they built a new crusher plant. This meant foundation excavations and filling work for the shovel. In addition, there was last season's stock pile to be cleaned up.

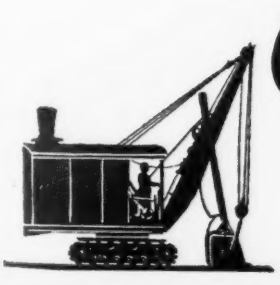
Odd jobs between seasons keep down equipment overhead, and the Thew electric is the ideal shovel for winter work. No steam to bother with; no watchman needed. Lock it up and go home at night. In the morning just throw the switch and get busy.

Cheaper than steam, too. This is true all year around. Current costs less than fuel and the maintenance item of the electric shovel is negligible.

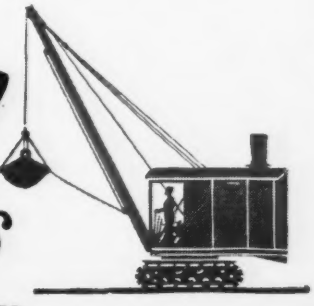
Now that the season is in full swing, this Thew is busy down in the pit loading rock for the crusher plant it helped to build.

Write for Bulletin 201 on the all year around electric.

THE THEW SHOVEL CO., LORAIN, OHIO



Thew Power Shovels



When writing advertisers please mention ROCK PRODUCTS

Working on a 15 to 25 per cent grade

Janesville Sand and Gravel Co., Janesville, Wis.

In eight hours' steady operation—lifting sand 35 feet—swinging 120 degrees—and making from 90 to 100 swings per hour—this Link-Belt Crawler Crane consumed only 21 gallons of gasoline.

The incline on which this crane is shown operating is from 15 to 25 per cent. Yet the automatic locking device absolutely prevents involuntary movement.

Two elements characterize Link-Belt Crawler Cranes. One is rugged construction; the other: economical performance.

It costs just four cents in postage to make a thorough investigation. First: Write the Janesville Sand and Gravel Company and get their opinion of the Link-Belt Crawler Crane. Second: Write to us for our Book No. 595.

LINK-BELT COMPANY

PHILADELPHIA, 2045 Hunting Park Ave.
CHICAGO, 300 W. Pershing Road
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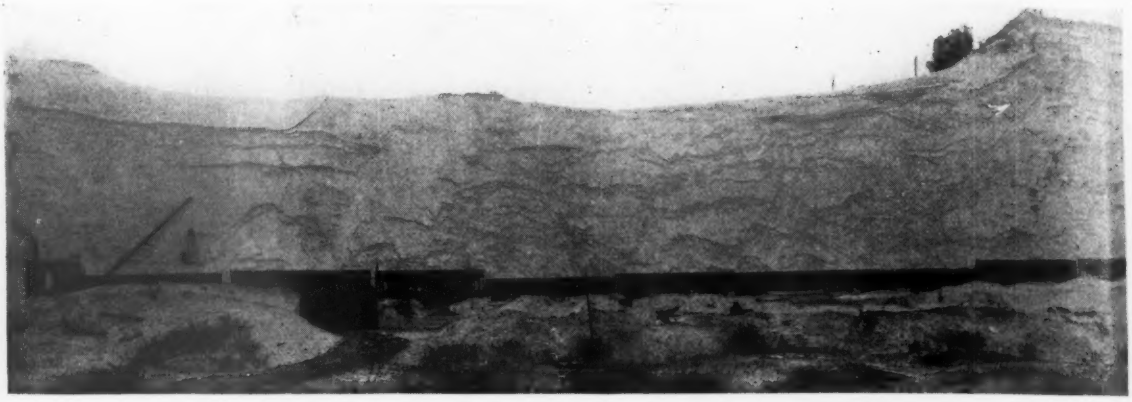

Doing the Work of 19 Men

This is what an "Industrial" Crane does at the plant operated by the Hubbell Sand Company of Manistee, Mich.

The present high cost and scarcity of labor makes this an important achievement, and if your production costs are too high, this tremendous saving should be worth investigating.

Read what the Hubbell Sand Company thinks of the "Industrial."

We have one 15-ton locomotive crane fitted with Orange peel bucket working in our clay pit, and one 12-ton locomotive crane fitted with the clam shell bucket, working around the plant, unloading coal, gypsum, etc.

Both cranes are Industrials, and we are glad to be able to state that we have had excellent results with the working of these cranes for the last ten years. We could not possibly do without them.

The Olympic Portland Cement Co., Ltd.
By A. F. Krabbe.

Replying to yours of the 8th. We are shippers of Lake Michigan blown sand only and the enclosed photo shows cars being loaded by us with an Industrial crane at our Ludington Pit.

We load, with this crane, from 25 to 30 cars per day, depending on the car supply, averaging 52 tons per car, with a crew of six men. One man can average only one car per day when loading by hand, so figuring on a 25-car-per-day basis, we eliminate 19 laborers with the use of a crane at this pit.

HUBBELL SAND COMPANY
G. A. J.

We have an "Industrial" 25-ton, 8-wheel locomotive crane operating 1½-yd. clam shall bucket in general service around washing and screening plant. We consider it an excellent machine and, of course, get a whole lot of service out of it.

Potts-Moore Gravel Company.
By Robt. J. Potts.

INDUSTRIAL WORKS
BAY CITY, MICHIGAN.

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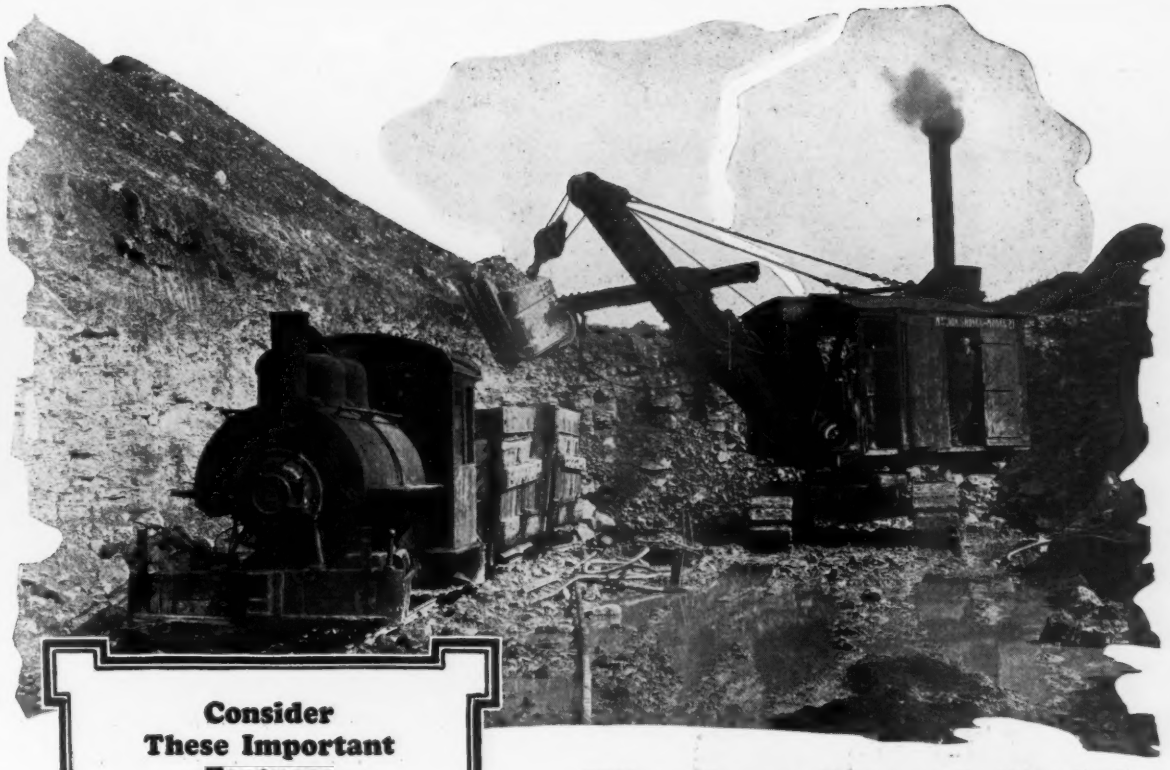
Locomotive, Erection and Wrecking Cranes, 5 to 200 tons capacity. Pile Drivers, Pillar Cranes, Transfer Cranes, Gantry Cranes, Crawling Tractor Cranes, Rail Saws, Grab Buckets, Double-Acting Steam Pile Hammers, Wood Grapples



Consider These Important Features On the New Model 21 Revolving Shovel

1. Three kinds of power—Steam, Electric and Gasoline-Electric.
2. 17 ½, 20 or 22 Ft. boom.
3. Crawling traction trucks, wide face wheels or railroad wheels.
4. Crawler trucks, steered **entirely** from upper cab. Operator needs no outside assistance.
5. Open hearth steel truck frame. No rivets or bolts to work loose. Exceptionally strong and substantial.
6. Hoisting, rotating and crowding units separate and independent, regardless of power used.
7. Boom and dipper handle of combination wood and steel, designed with proper strength and resiliency.
8. On steam machine, vertical hoisting engines and through-tube boiler. Less fuel and lower maintenance.
9. Convertible into dragline, clamshell and orangepeel excavator.

Many other features explained in Bulletins 228 and 305. Write for them.

When Large Output Is Needed — GET A MARION

When maximum capacity is desired at lowest possible operating and maintenance cost you can depend on a Marion to produce satisfactory results. This, because—

Marion Shovels are Correctly Designed

They are thoroughly up-to-date, possessing all the latest features and improvements known in power shovel construction.

They are Built Unusually Strong in Every Part

For instance, on small revolving shovels, the dipper front, shipper pinions, dipper handle racking and bevel propelling gears are made of manganese steel. Important shafts are hammered steel and castings subjected to heavy strains are of open hearth steel, heat treated.

They are Easy to Operate and Inexpensive to Maintain

Operators prefer Marions because adjustments to wearing parts are easy to make and require but little time. The three lever control adds to the efficiency and insures easier running and greater speed.

Prompt and Reliable Service is Assured

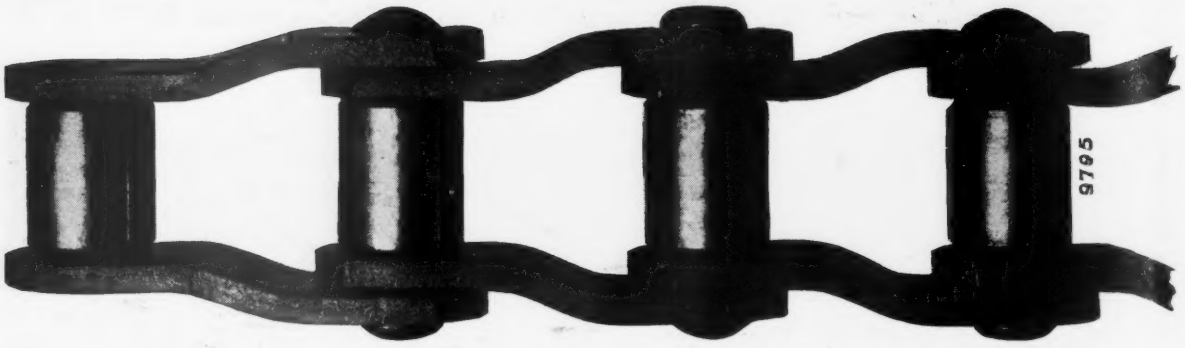
With our modern and complete factory—the largest of its kind in the world—prompt and efficient service is assured after the shovel is in operation. Marion parts always fit for they are made to the interchangeable system of gauges, jigs and templets.

279

The Marion Steam Shovel Company

Marion Ohio.

Marion Crawler Trucks Make Hard Going Easy



Jeffrey SS 40 Chain

For Severe Driving Service In Cement Mills

Showing simple method of assembling. The pin and the thimble both form a rigid joint with the side bar.

Operates over No. 103 Standard Sprockets. Easily assembled. The hardened wearing parts and the high carbon steel side bars make this chain very adaptable to hard service.

All wear on the moving parts is confined to the renewable steel pins and bushings. Square Shank under the head of pin insures the rigid holding of the pin in the side bar.

Large stock always available.
Write for prices

Jeffrey Labor-Aiding Equipment includes:

Chains for all Elevating, Conveying and Power Transmission requirements; Elevators, Conveyors, Crushers, Pulverizers, Portable Loaders and Belt Conveyors, Industrial and Mine Locomotives, etc.

The Jeffrey Manufacturing Co.

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Palmer Lime & Cement Co. Endorse Plymouth Locomotives

This plant, located at York, Pa., is one of the best equipped in the east. Mr. King, the superintendent, is enthusiastic because of the service rendered by the PLYMOUTH Locomotive.

In a letter he says: "Dirt removed by the PLYMOUTH amounts to 21 3-yard cars per 10 hours, and the stone handled in the same number of hours from the Ebhert quarries is 21 cars daily. The Ebhert quarry does not adjoin the plant, which necessitates long trips bringing load cars over and taking empties back.

It is certainly a busy locomotive and giving splendid satisfaction."

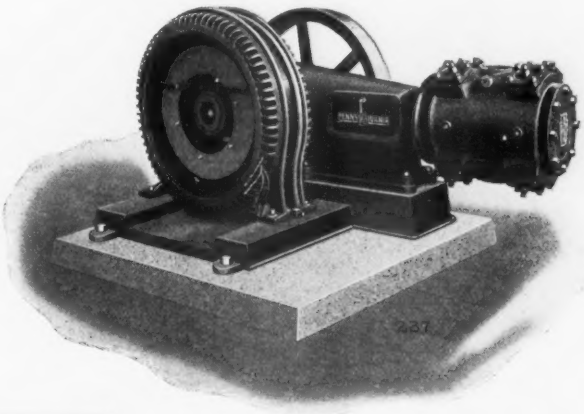
Write for Catalog and Performance Bulletins

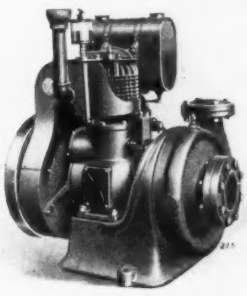
THE FATE-ROOT-HEATH CO.

PLYMOUTH, OHIO

PLYMOUTH

Gasoline Locomotives





PENNSYLVANIA
AIR COMPRESSORS
VACUUM PUMPS
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Operating Reliability — Efficiency — Ruggedness

These three terms represent the combination of qualities you get with every PENNSYLVANIA unit.

You will find in them features that come only with intimate knowledge of the exacting requirements of this class of equipment, and long experience in their design and manufacture.

They can be supplied for any standard drive, including direct connection to synchronous motor—another PENNSYLVANIA innovation for this class of service.

Write the nearest branch for literature NOW—and be sure to send PENNSYLVANIA specifications on your next requirements.

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PUMP AND COMPRESSOR COMPANY

MAIN OFFICES AND WORKS EASTON, PA.

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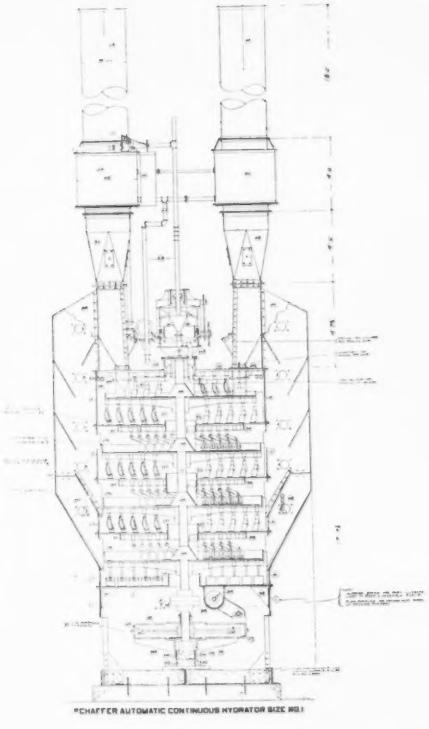
A Typical Schaffer Lime Plant—The American Lime & Stone Co., Bellefonte, Pa.

The Schaffer Hydrator



"SCHAFFER AUTOMATIC CONTINUOUS HYDRATOR SIZE NO.1

The Schaffer stands out above all similar machines on the market largely because it does so much for so little.

It is a matter of general knowledge that the Schaffer yields nothing in performance to any other hydrator; in fact, it is a better machine not alone in performance, but in the lower cost of maintenance, due unquestionably to the design, the unusual degree of mechanical balance that always assures reliable service and action.

Lime is delivered by weight, not volume; water is added in exact proportion; and the operation is continuous and AUTOMATIC.

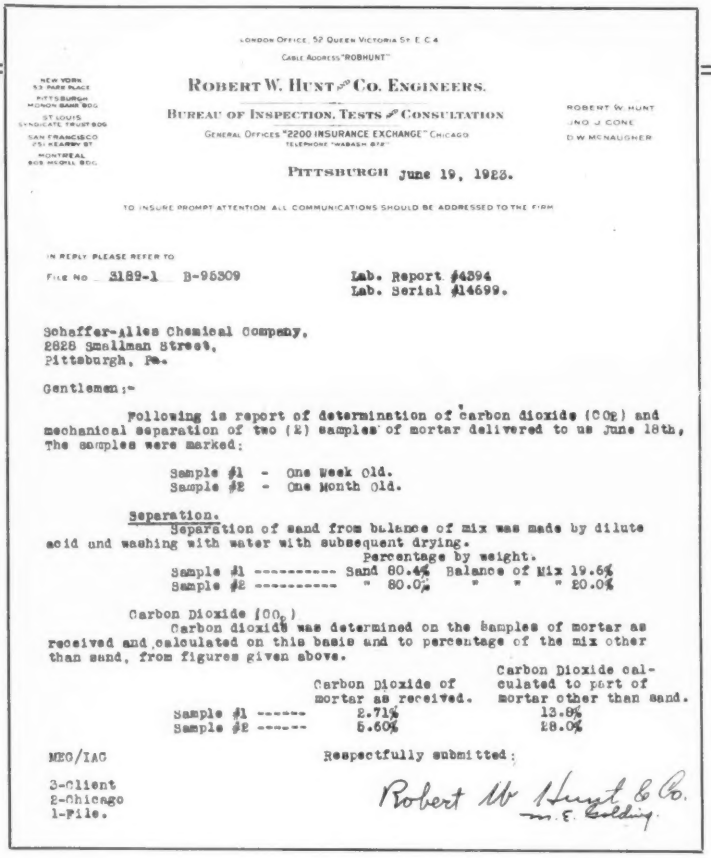
Either high calcium or dolomite lime can be handled with equal success.

Consult with our engineering department regarding your requirements

Schaffer Engineering & Equipment Co.

2828 Smallman Street **Pittsburgh, Pa.**

An Important Report on the S-A Lime Hardener



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ROBERT W. HUNT
JNO. J. CONE
D.W. McNAUGHER

PITTSBURGH June 19, 1923.

TO INSURE PROMPT ATTENTION ALL COMMUNICATIONS SHOULD BE ADDRESSED TO THE FIRM

IN REPLY PLEASE REFER TO

File No. 3189-1 B-95309 Lab. Report #4294
Lab. Serial #14699.

Schaffer-Alles Chemical Company,
2828 Smallman Street,
Pittsburgh, Pa.

Gentlemen:-

Following is report of determination of carbon dioxide (CO_2) and mechanical separation of two (2) samples of mortar delivered to us June 18th, The samples were marked:

Sample #1 - One Week Old.
Sample #2 - One Month Old.

Separation.

Separation of sand from balance of mix was made by dilute acid and washing with water with subsequent drying.

Percentage by weight.

Sample #1 ---------- Sand 80.4% Balance of Mix 19.6%
Sample #2 ---------- " 80.0% " " " 20.0%

Carbon Dioxide (CO_2)

Carbon dioxide was determined on the Samples of mortar as received and calculated on this basis and to percentage of the mix other than sand, from figures given above.

	Carbon Dioxide of mortar as received.	Carbon Dioxide calculated to part of mortar other than sand.
Sample #1 ------	2.71%	13.8%
Sample #2 ------	5.60%	28.0%

MEG/IAC

Respectfully submitted;

Robert W. Hunt & Co.
M.E. Belding

3-Client
2-Chicago
1-File.

The engraving shown here is a photographic copy of the report made by Robert W. Hunt & Co., engineers, verifying every claim we have made for this product that promises to revolutionize the lime business.

S-A Lime Hardener consists of a combination of various chemicals that build up a process which makes lime active. S-A Lime Hardener does not in itself harden lime, but makes the lime active in performing its own work of hardening or reverting to a carbonate.

It is a known fact that lime will destroy any artificial hardener, and in this case S-A Lime Hardener disappears as the process of hardening completes itself.

Considering the prestige of Robert W. Hunt & Co., there can remain no doubt in the minds of any skeptic that S-A Lime Hardener will make a plaster that will live forever and have every desirable quality.

Schaffer-Alles Chemical Company

2828 Smallman Street

Pittsburgh, Pa.